

Contractors and Engineers Monthly

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Highlights Of This Issue

● Pennsylvania Turnpike

The construction of the 4,574-foot Laurel Hill Tunnel, one of the longer tunnels on the Pennsylvania Turnpike, and a 60,000-yard hard-rock cut on one of the many grading contracts on the project are described in this issue.

See page 2.

● New Trunk Sewer

Continuing our series on the construction of the new North Metropolitan Trunk Sewer for suburbs of Boston, Mass., the two articles in this issue describe the difficulties encountered on Sections 101 and 104B, most of which were driven under air.

See page 2.

● County Road Work

In addition to the highway work on their own roads, Wisconsin counties handle maintenance and snow removal for the state highways within their territories. The organization, equipment and methods employed by Walworth County for its road work are described in this issue.

See page 7.

● Unusual Twin Bridge

The twin bridge over the upper end of the famous Canadian Henley Regatta course was recently completed in Ontario to carry the two divided 30-foot roadways of the new Queen Elizabeth Way.

See page 9.

● Protecting Road from Flood

To protect the famous Mohawk Trail in western Massachusetts from damage by further floods, heavy concrete retaining walls, heavy riprap and river channel excavation were rushed to completion on a 5-mile stretch along this scenic route.

See page 15.

● Speedy Concrete Paving

Aided by the fact that the paver was run on the shoulder instead of on the subgrade, the contractor for a 6.51-mile concrete paving contract in Illinois last summer was able to maintain 1,200 feet of 22-foot 9-7-9-inch pavement daily, in spite of several stretches of bad subgrade.

See page 17.



A section of the Bankhead Tunnel under construction at Mobile, Ala.

Vehicular Tunnel For Mobile, Ala.

New \$4,000,000 Tube Under Mobile River Was Built in Sections, Floated to Site And Sunk into Trench

THE construction of a \$4,000,000 vehicular tunnel is well under way at Mobile, Ala. The tunnel, which is scheduled to be completed about July 1, extends under the Mobile River and when completed will cut off 7 miles from U. S. Route 31, the main approach to the city from the north. The tunnel has been named the Bankhead Tunnel, in honor of the late Senator John H. Bankhead of Alabama, a leading exponent of better roads and for whom the Bankhead Highway is named.

The tube will be 2,000 feet long and have a two-lane highway 21 feet wide

(Concluded on page 18)

Experimental Bases Of Sandy Materials In Massachusetts

Standard Specifications Were Modified to Permit Use of a Sandy Clay and Asphalt Emulsion Binder

By W. F. DONOVAN, Highway Engineer,
Massachusetts Department of Public Works

MASSACHUSETTS has an abundance of gravel and suitable crushed stone for base construction except on Cape Cod where no stone is available and where the natural subgrade is a poorly graded sand. It has been customary in the construction of roads on the Cape, during the past few years, to provide a 2½-inch broken-stone base penetrated with 1½ gallons of 85-100-penetration oil asphalt per square yard. In 1937 the Massachusetts Department of Public Works made a contract with the town of Bourne to construct a road known as Trading Post Corner Road 24 feet wide with a 2½-inch crushed-stone sand-bound base and a 1½-inch bituminous-concrete Type I top. The cost of this surfacing was estimated at \$4.86 per cubic yard for 790 cubic yards of broken stone, making a total of \$3,839.40, and \$1.20 per cubic yard for 200 cubic yards of sand, totaling \$240.00, or a grand total of \$4,079.40. It was figured that this would provide 11,218 square yards of surface at an estimated cost of 37 cents per square yard. On this job, due to the lack of sufficient funds, the asphalt was omitted and a sand binder substituted.

With a view to reducing the cost of

surfacing in this section, the writer decided to try experiments with a sand-clay stabilized base and an asphalt-emulsion binder in order to eliminate the imported crushed stone. With the cooperation of the officials of the town of Bourne, a section 600 feet long on the Trading Post Corner Road was selected in order to try out a stabilized base under the bituminous-concrete wearing surface. A mix was designed to consist of 2½ inches of natural sand base over which a layer of 2½ inches of loose sandy clay was spread. This material contained only 8 per cent of clay with about 25 per cent of fines passing a 200-mesh sieve. The natural subgrade material was a silty sand containing about 20 per cent fines, passing a 200-mesh sieve.

It was found by laboratory investigation that a 50-50 mix of this sand and clay, well-mixed with 3½ to 4 per cent asphalt emulsion, would develop a stability of about 4,000 pounds and so arrangements were made to construct a base in accordance with the results of these tests.

Mixing and Rolling the Base

The 2½ inches of clay were spread over the existing subgrade of sand and dry-mixed with spring tooth harrows to a total depth of 5 inches. Water was then applied at the rate of 1 gallon per square yard and again the harrows went into operation to mix the sand and clay thoroughly. The emulsion was then applied in five operations, amounting to a total of 1.7 gallons per square yard. Some difficulty was encountered in the application of the emulsion, due to the fact that the distributor had to operate down grade and considerable quantities of the emulsion flowed along the wheel ruts, and through leaching some of the bitumen was lost.

The asphalt was all applied in one day, and the mix was allowed to stand over night before any attempt was made to blade it. The following day, the mix was still very wet, and little could be accomplished in the way of blading until the third day after the asphalt was applied. Then the material was bladed to shape and partially compacted with a sheepfoot roller. The surface at that time was soft and would not stand any rolling or traffic.

During the following week the weather was cold, damp and rainy and the mix showed very little evidence of setting up. Finally, with the arrival of a few warm days, the surface hardened quickly and was rolled with a 10-ton roller. Within two weeks the bituminous-concrete Type I top was constructed.

(Concluded on page 41)

WORK PROGRESSES AT SANTEE-COOPER



Excavation under way for Pinopolis Dam of the Santee-Cooper Project in South Carolina. In the background are the camp buildings of the Central Engineering Co., general contractor. See page 13.

IN THIS ISSUE

Bituminous Roads	1
Bridge Construction	9, 18
Cartoon	4
Concrete Roads	17
County Road Work	7, 25
Editorial	4
Flood Control	15
Grading	2, 22
Roadside Developments Awards	4
Roadside Planting	23
Santee-Cooper Project	13
Sewer Construction	2
Tunnel Construction	1, 2
World's Fair Roads	33

Tunneling at Laurel Hill, And 60,000-Yard Rock Cut On Pennsylvania Turnpike

One of the Longer Tunnels Was Driven with Drifts at East Portal and Full Face At West End

(Photo on page 44)

† LAUREL HILL Tunnel, 4,574 feet long portal to portal, is one of the longer tunnels on the Pennsylvania Turnpike and saves a total climb of about 350 feet over the old route. About 800 feet of this tunnel was already driven by the South Penn contractors in the 1880's and use was made of a portion of this at the west end, but at the east end the portal of the old tunnel had collapsed so a new portal was started in rather poor rock requiring special treatment.

Contract 13, for the construction of Section L-2, the Laurel Hill Tunnel, was awarded to Hunkin-Conkey Construction Co. of Cleveland, Ohio, on April 3, 1939, on its low bid of \$1,920,281.48. The project was 12,618 feet in length, as it included the tunnel and the east and west approaches, and required a total of 515,000 cubic yards of excavation and 32,000 cubic yards of concrete, with 3,000,000 pounds of steel chiefly for tunnel lining. Features of this work were the fact that poor rock at both portals required Guniting, and the east portal was started with three drifts before full-face operations were begun. Similar Guniting was required at the west portal, but full-face operations were used throughout.

At the west portal the contractor set up a large stone-crushing plant to furnish all of the aggregate for the tunnel lining and built a large side-hill storage area of wood, adjacent to the tunnel portal, from which the aggregates could easily be moved to the concrete batching and mixing plant when set up in the late fall of 1939. The grading of both approaches was done by Hinman Brothers of Denver, Colorado, as subcontractor.

The East Heading

Because of the soft red shale, the east heading was started with two side drifts in which wall plates were set, and then a top drift was run. This was continued for about 90 feet, then the core was removed and the timber set, working out to the portal. After this, the full top heading 14 feet high was carried on, drilling one side and mucking the other with a Conway mucker. Nine wood segments were used for the arch. At the east heading also a wooden trestle was



C. & E. M. Photo
A Northwest 2 1/2-yard shovel loading shattered rock to a Euclid truck.

run along the approach about 8 feet 6 inches above the subgrade, near the portal, and on a 3 1/2 per cent grade down until it finally reached the elevation of the subgrade and was continued on to the spoil pile. The entire face of the

(Continued on page 10)

York Engineering Co. Moved 60,000 Yards of Hard Rock In One Cut on Contract 21 Which Was Largely Ledge

† CONTRACT 21, Section 13C, on the Pennsylvania Turnpike packed a lot of hard rock, about 80 per cent of all excavation, and five structures into the 2.47 miles of the job. The Commission awarded the contract for this section to York Engineering Co. of York, Penna., on May 4, 1939, on its low bid of \$315,406.36, allowing 115 calendar days for completion. The section is located about midway between Bedford and Everett and immediately east of the same company's Contract 20 for the construction of the Juniata River Viaduct. This article is confined to the operations in one 60,000-yard rock cut of hard bastard limestone.

The total quantities for Contract 21, Section 13C, included 375,000 cubic yards of Class 1 excavation and borrow, 2,100 yards of Class A concrete, 4,500



C. & E. M. Photo
A Cleveland wagon drill working in the 60,000-yard hard-rock cut on the York Engineering Co.'s Contract 21, Section 13C, on the Pennsylvania Turnpike.

cubic yards of Class B concrete and 540,000 pounds of plain steel reinforcing bars for concrete structures.

Rock Drilling

Air for the two Ingersoll-Rand and two Cleveland wagon drills used by York on this job was furnished by an Ingersoll-Rand Type 40 portable compressor mounted on a truck and a 2-stage I-R air-cooled Model 75 compressor driven by an International diesel, also truck-mounted. These two compressors delivered air to a large air

(Concluded on page 16)

New Metropolitan Sewer

Shield Weighing 45 Tons Delivered Assembled, Had Difficulty with Clearance; Driving the Tunnel

† SECTION 104B of the North Metropolitan Trunk Sewer of the Metropolitan District Commission was awarded to C. & R. Construction Co. of Boston, Mass. The contractor excavated a shaft 23 feet in diameter and 41 feet deep in a vacant lot at the corner of Lewis Street and Revere Beach Parkway in Everett, Mass., and drove two headings, one 10 feet 6 inches diameter for 1,480 feet west, and the east heading 11 feet 3 inches diameter for 775 feet.

The shaft was faced with steel liner plate and rib construction for the entire depth. At a depth of 30 feet a sand pocket was struck which admitted considerable water to the excavation. A pipe was driven inside and the pocket bled during the sinking. At 17 feet above the bottom of the shaft, on the concrete anchorage for the shields, two Watson-Stillman hydraulic pumps were mounted to furnish hydraulic power for the shield. At the bottom of the shaft, to take care of the water bled from the



C. & E. M. Photo
Lowering the 45-ton shield down the shaft on Section 104B of the North Metropolitan Trunk Sewer.

side and that accumulating from the heading, an Ingersoll-Rand air pump was first installed, succeeded by a La-Bour electric-driven sump pump.

Delivering the Shield

The first shield, 14 feet 8 5/8 inches outside diameter, for the east heading was delivered assembled and lowered into the shaft. Even with the most modern equipment, consisting of an underslung equipment trailer, this was not easy. The shield was manufactured by the James Russell Boiler Works, Dewar Street, Dorchester, Mass., and hauled to the shaft cross country at night by a devious route, 10 miles longer than the most direct route which would have been only 9 miles. This was necessary to dodge the elevated railway structure in Boston, which did not have sufficient clearance to permit the 45-ton shield to be hauled beneath it. A Fruehauf trailer with 16 wheels at the rear was used by Daniel Marr, Steel Erector, for hauling the shield. It was then lowered into place by Marr, using two specially rigged Link-Belt crawler cranes rented from George A. Baker Co. of Boston.

Driving the Tunnel

A stiffleg derrick mounted in the yard at the top of the shaft was used to handle all muck coming out and all steel going

(Concluded on page 31)

C. & R. Construction Co. Met Bad Ground in Driving the Shaft on the North Side of Chelsea Creek; Open Cut

† THE new North Metropolitan Trunk Sewer rapidly approaching completion through Medford, Everett and Chelsea, Mass., will be carried under Chelsea Creek to the East Boston Pumping Station through two precast 60-inch concrete pipes in a 14.5-foot tunnel. This tunnel will carry three pipes, the lower two carrying the sewage from the new Metropolitan Trunk Sewer and the other replacing an existing siphon which now lies above the elevation to which the bed of Chelsea Creek is to be lowered by the War Department.

This short contract, Section No. 101, is composed of 975 feet of tunnel, three shafts, 190 feet of open cut north of the

(Continued on page 26)



C. & E. M. Photo
The west portal of Laurel Hill Tunnel, Pennsylvania Turnpike, showing the face of rock Gunitied to prevent slides, and the blower house and vent pipe in the foreground.



C. & E. M. Photo
Timber and steel wales and braces on open cut on Section 101 of the North Metropolitan Trunk Sewer.

NOT EVERY CRUDE OIL

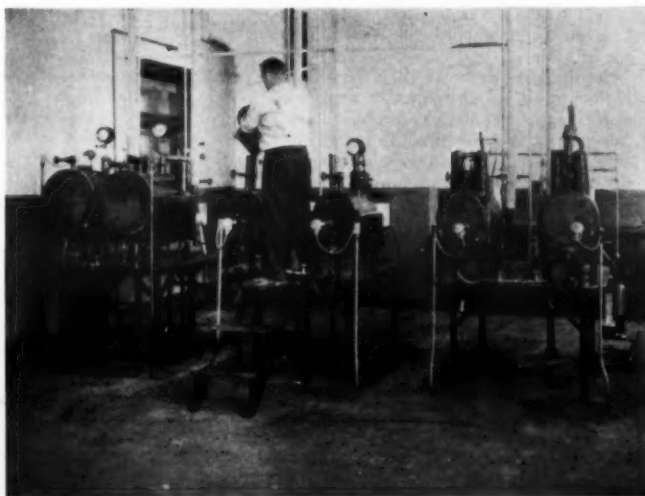
has what it takes

TO PRODUCE HIGH-GRADE ROAD ASPHALTS

Step No. 1 in producing high-grade Road Asphalts is the careful selection of the crude oils from which they are refined.

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A slow-curing TEXACO Liquid Asphaltic product being used in the construction of a low-cost, all-weather surface on a Colorado highway.



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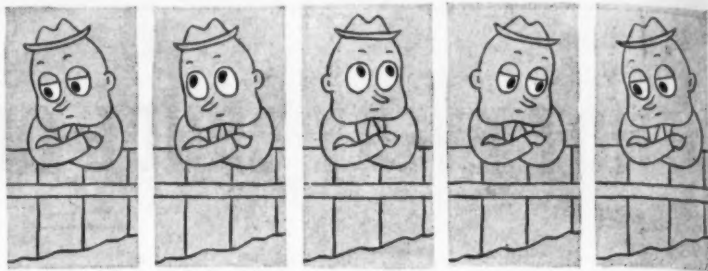
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Steam shovel.

Roadside Development Awards for This Year

With the 1940 construction season getting under way, it is also time to start thinking about CONTRACTORS AND ENGINEERS MONTHLY Roadside Development Awards for 1940. Although the competition closes on November 1, now is the time to start collecting the necessary data, and particularly the "before" and early progress pictures which must accompany the nominations.

These Roadside Development Awards are made to highway contractors or their superintendents for outstanding contributions to better roadsides on their highway contracts of the current construction season. This work does not necessarily have to be done on a roadside development project, nor on a contract containing roadside development items. The purpose of the Awards is to stimulate a greater interest on the part of highway contractors in basic roadside-development work involved in practically any highway grading, widening or relocation project.

Such work may include unusual care in dressing borrow pits, handling and stocking top soil, care in preserving existing trees and roadside vegetation, backslapping, handling of drainage items, the preparation for seeding later

but the Hoosier engineer thought it over and then sadly replied, "No. Based on our paved road maintenance costs, it would take several times our construction and maintenance funds combined to maintain all that mileage."

It all boils down to this: build our highways to be adequate for a reasonable life; put construction money only into the roads which need improved surfaces; do not overbuild and thus unnecessarily increase the annual maintenance burden.

by state highway department forces, and similar work which lays the basis for roadside development in the future. A contractor's contribution may also be the development of any new tools, equipment or methods for handling any such items, the use of which increases the efficiency of the work, cuts its cost, or definitely contributes to the final result; or it may be an unusually co-operative attitude on the part of the contractor or his superintendent, or suggestions for handling the work which affect the appearance of the roadside or lowers its future cost of maintenance. Examples of the type of work for which contractors received the 1939 Awards were given in the articles on roadside development in the February, March and April issues of CONTRACTORS AND ENGINEERS MONTHLY.

Announcements have already been sent to the state highway department engineers, who make the nominations for the Awards, and we suggest that those state highway departments which have not yet secured additional copies of these announcements to distribute among their district and resident engineers do so at once, so that the collection of necessary data will not be delayed until too late.

State highway engineers and highway contractors and their superintendents may secure full information on these Awards by writing direct to the Editor, CONTRACTORS AND ENGINEERS MONTHLY, 470 Fourth Avenue, New York City.

Highway Money Diverted

Thirteen cents out of every highway user's 1938 state tax dollar was devoted to non-highway purposes, according to the U. S. Public Roads Administration. Only 66 cents was spent for construction and maintenance and the rest for highway debts and administration.

Maintenance Devours Highway Budgets

In his enlightening paper prepared for presentation at the joint meeting of The Institution of Mechanical Engineers of Great Britain with the A.S.M.E. in New York last autumn, Frederick C. Horner, Assistant to the Chairman of General Motors Corp., stated, "... we are now realizing that maintenance of highways ... is the increasing feature in our national highway financing. Two or three decades ago, the uninitiated thought that highways were practically everlasting and that the initial cost was the only cost, but as the years move along, maintenance costs of highways are probably destined to equal or surpass costs of original construction."

While Mr. Horner's discussion was aimed chiefly at the abnormal maintenance costs of huge mileages of super-highways which would become an unbearable burden on an already tax-laden motoring public, the thought he expresses should be heeded by all who build our roads. More and more consideration must be given to making the area between the right-of-way markers truly permanent through increasing attention to proper roadside development to check erosion and reduce such maintenance expenses as mowing and clearing culverts.

The traveled way, comprising the subgrade, base and surfacing then needs scrutinizing. We all recall too readily the glib sales talk of "permanent" roads, surfaces that unhappily were not permanent themselves but

rather were heir to all the ailments that sunshine and weather could lay upon them, placed upon subgrades which lacked the elementary drainage that now is the primary step after the soils engineers have made their studies. Failure to study every subgrade soil, every material of construction used in the highway, every process of mixing, spreading or placing, every finishing and curing process, adds to the mounting maintenance costs which are eating into our highway budgets.

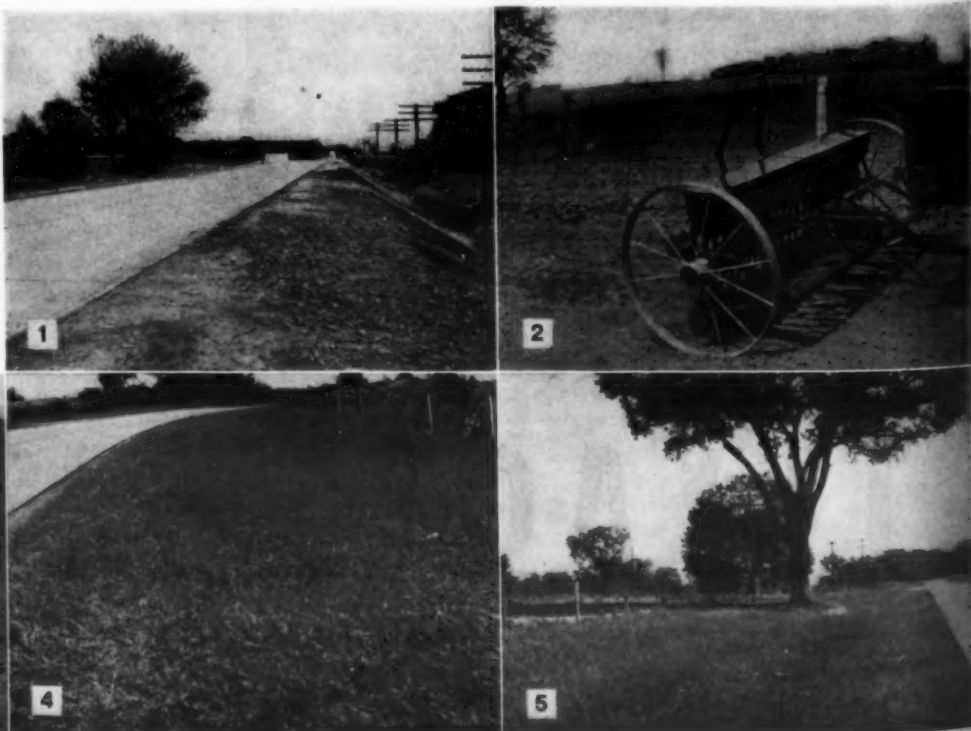
In our secondary road system, the vast network of county highways, what of maintenance there? Dirt roads still dominate the picture and probably will for decades to come because traffic will not warrant expenditures for surfacing. But care in the establishment of drainage channels has already cut maintenance charges against dirt roads in progressive counties.

How much paved road can the rural county afford? Only such portion as traffic requires to prevent actual damage to roads and hazard to vehicles from mud in wet seasons and dust in dry ones. The hypothetical question propounded by a keen Midwest professor of highway engineering to a county engineer and the latter's reply gives a more complete answer.

"Suppose a very wealthy man offered to pave every mile of the county's roads at no cost to the county, could you afford to accept?" The impulse was, of course, to answer with a joyous "Yes,"

ROADSIDE PLANTING

Scenes on a 5.991-mile roadside-planting project on Ohio Route 29 in Fayette County for which the W. A. Watrop Co. of Cincinnati was the contractor. 1. A section of the route before planting was begun. 2. The contractor introduced the use of this seed drill for planting the grass seed on this project. 3. A section of shoulder immediately after planting, showing the deep grooves cut by the drill. 4. The same spot along the road, showing the stand of grass. 5. A scene on the completed project. See page 23.



W. R. Smith, Contractor And ARBA Official, Dies

William Rice Smith, aged 72, well-known in New England contracting circles and a past president of the American Road Builders' Association, died recently of a heart attack at his home in Meriden, Conn.

Mr. Smith was born in North Haven, Conn., in 1867, and in 1893 moved to Meriden where he entered the crushed-stone business and later became an associate of the late John S. Lane, founder of the Lane companies. When

the Lane Construction Corp. was organized in 1902, Mr. Smith was made General Manager and, since 1913, has been its President.

For many years he was a member of the Board of the Directors of the American Road Builders' Association, prior to his election as president. Under his guidance the Association increased its activities for a more nation-wide movement of highway improvement and construction. At the annual meeting of the ARBA in January of this year, Mr. Smith was elected Vice President of the Highway Contractors' Division.

Robins Moves Offices

For more than 40 years, the Robins Conveying Belt Co. has maintained its offices in the Park Row Building in New York City. This company, founded by Thomas Robins, designs and manufactures belt conveyors and material-handling machinery.

On May 1 Robins moved its offices to a new three-story brick office building in Passaic, N. J., where the executive, engineering and sales departments can be in closer touch with the manufacturing facilities which are also in

Passaic. A New York sales office will be located at 70 Pine Street, New York City.

New Osgood Distributor

Announcement has been made by the Osgood Co., Marion, Ohio, of the appointment of J. W. Yeagley, 1828 Bissonnet St., Houston, Texas, as distributor for the full line of Osgood excavating and material-handling equipment, ranging in size from $\frac{3}{8}$ to $2\frac{1}{2}$ cubic yards, in the southern half of Texas.

A many-fisted battler

AT CALAVERAS DAM



THE variety of jobs which can be handled—speedily, economically, profitably—with "Caterpillar" Diesel Tractors is being widely demonstrated throughout the contracting field. Their adaptability for teamwork with other equipment is also well known. There is no better example of this than is exhibited in the outfit and work shown in these pictures—all construction scenes on the Calaveras (California) Dam project.

With a Hyster winch, and a Trackson Traxcavator with bulldozer attachment, this "Caterpillar" D4 can really "go to town." It can scoop, carry and load (or dump) in

one continuous operation. It can bulldoze earth, rock and rubbish. It can hook onto wagons, trailers, trucks; move equipment. And when the load is unusually heavy or the going extra-tough, it can "give it the winch" with almost double the drawbar pull.

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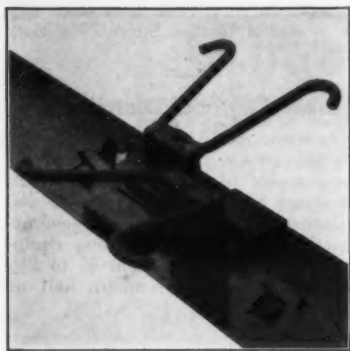
Leading manufacturers of contracting equipment power their products with "Caterpillar" Diesel Engines or design them for operation with "Caterpillar" Diesel Tractors. "Caterpillar" parts-and-service facilities are the most complete and most widely convenient of their kind in the world. There are wide ranges of "Caterpillar" Diesel Tractor, Motor Grader, Engine and Electric Set sizes.

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TRACK-TYPE TRACTORS • ROAD MACHINERY
DIESEL ENGINES AND ELECTRIC SETS

• "Caterpillar" Diesel D-4 equipped with Hyster winch and Trackson Traxcavator with bulldozer attachment.
A—Moving earth-and-rock with bulldozer attachment.
B—Tightening guy lines on gravel benders with winch.
C—Hauling heavy fuel truck with drawbar hitch.
D—Loading truck with high shovel.
E—Delivering gravel to conveyor with shovel.





The Translode Angle-Unit with anchoring lugs on a continuous base for expansion and contraction joints.

Improved Road Joint Has Continuous Base

The Translode Angle-Unit with a continuous base for expansion and contraction joints is a load-transfer device which is claimed to eliminate dowel-bar alignment problems, is rigid yet light in weight, and is a complete joint which can be handled and placed on the subgrade by one man.

As an expansion joint, this unit is furnished in one piece as a complete joint for half of the width of the pavement. All parts are attached to the 6-inch wide 20-gage continuous base plate. The load-transfer angle-units with anchoring lugs are seated tightly into the 14-gage steel void pockets, with expansion provision, and are spaced on 20-inch centers. The filler board is seated between the vertical angle-units and also between the metal clincher lugs which are punched and formed to engage either side of the filler. Holes are provided in the base plate for spiking to the subgrade for alignment.

The Translode Angle-Unit contraction joint is also furnished in lengths half the width of the pavement. The 4-inch wide base plate is of 20-gage steel with lug sockets punched upward from the base plate to engage the load-transfer units. These units are seated through openings provided in the lower edges of the vertical 20-gage dividing plate which is riveted to the continuous base plate. The load-transfer units are oiled or greased to prevent bond to the concrete.

Further information on these Translode Angle-Unit joints, with a description of various installation methods, is contained in literature which may be secured by interested contractors and highway engineers direct from the Highway Steel Products Co., Chicago Heights, Ill., or from this magazine.

Concrete Vibrators

The third edition of the Chicago Pneumatic Tool Co.'s catalog covering its line of pneumatic and electric vibrators for reinforced and mass concrete placement has just been issued. Copies of this 12-page catalog S.P. 1955 may be secured by interested contractors and engineers by writing direct to the company at 6 E. 44th St., New York City, and mentioning this item.

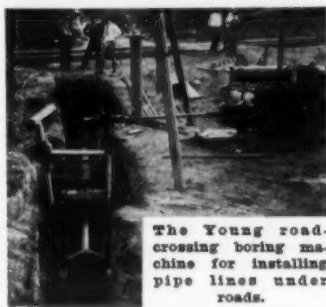
In addition to describing and illustrating C-P vibrators, this new catalog contains considerable valuable information

on the subject of concrete vibration, its advantages, and the proper method of selecting vibrating tools.

New Boring Machine For Pipe Line Jobs

The Young boring machine which installs casings up to 36 inches in diameter for water, gas and oil lines, sewers or conduits, under highways and railroads or through embankments has recently been announced by the Young Engine Corp., Canton, Ohio. This machine is fundamentally a horizontal rotary drill, using the pipe or casing to be installed as a medium for carrying the rotating cutter head. The driving sleeve is hollow to permit the removal of dirt through the pipe. Flexible and adjustable power connections are provided to meet all operating conditions.

In operation, the machine is placed in the ditch with a 20 or 30-hp gasoline power unit set up on the bank at the side. The casing to be installed is at-



The Young road-crossing boring machine for installing pipe lines under roads.

tached to the driving head of the machine which is an 8 x 13½-inch forged steel flange on the forward end of a rotating hollow sleeve. The combined rotating and forward thrust of the sleeve forces the pipe with the cutter head into the embankment. After the hollow driving sleeve has been advanced to its full extent, it is unflanged from the casing and returned to its starting position. Then an 8-inch x 6-foot flanged extension joint is inserted

between the rear end of the pipe and the driving sleeve. This operation is repeated until the total length of the inserted extension joints exceeds that of the next joint casing. All the extension joints are then removed and the next section of pipe is welded or screwed to the preceding one, and the cycle of operations is repeated.

Copies of Bulletin C-15-E describing in further detail the Young boring machine and its uses may be secured by those interested direct from the manufacturer or from this magazine.

Wellman Promotes Swalley

Announcement has been made of the appointment of W. C. Swalley as Assistant General Sales Manager of the Wellman Engineering Co., Cleveland, Ohio. In addition to handling the sales of Williams clamshell and dragline buckets, as in the past, Swalley will assume the broader duties of assisting in the sale of all Wellman engineered equipment.

KEEPS VALVES WORKING

Regardless of...

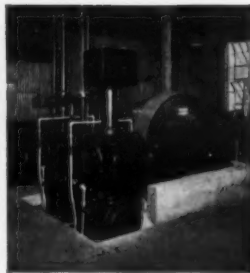
MAKE,

SIZE,

SERVICE!



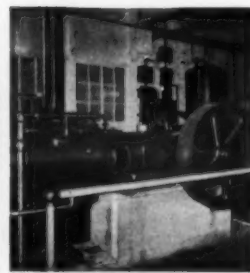
EXCAVATING



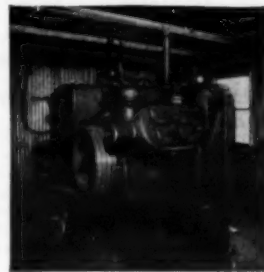
QUARRYING



ROAD WORK



FACTORY



GOLD MINE



SEWER JOB



POWER HOUSE



GLASS WORKS

LET THESE PICTURES suggest that it might be profitable for you, also, to look to your air compressor lubrication.

Operators in all these fields are daily proving that they can keep their air compressors at top efficiency with less cost . . . by lubricating with Texaco Alcaid, Algol or Ursa Oils.

When you turn to Texaco, it is very possible that such benefits as: cleaner valves and ports, less maintenance, repairs, and replacements, more pressure with less power, will promptly result.

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Management Methods In Wisconsin County

Interview With H. J. Peters, Highway Commissioner for Walworth County, Indicates How System Is Maintained

+ WISCONSIN counties are responsible not only for the construction and maintenance of the county highway system but also, under the direction of the Division Engineer of the State Highway Commission, they maintain the state highways and clear them of snow in winter. In Walworth County, with headquarters at Elkhorn in southern Wisconsin, H. J. Peters, County Highway Commissioner, heads an organization that maintains 172.24 miles of county roads outside of the cities and villages, and 139.25 miles of state primary, secondary and trunk highways. The county is 24 miles square, with Elkhorn at the geographical center. The 703.34 miles of township roads, and streets in cities, towns and villages are not under county maintenance in Walworth County.

Organization

The Board of Supervisors of the county is composed of the chairmen of the Township Boards, one supervisor elected from each village, and one from each ward in cities. This makes a Board of thirty-four in Walworth County. The Board elects a County Highway Committee of three members and a County Highway Commissioner, who is the county engineer.

For administrative purposes the county is divided into seven patrol sections for the county roads and seven similar sections for the state roads. There is a patrolman with a helper for each section. He is equipped with a truck and small hand tools, a mower pulled by the truck, and a light pulled grader. The division is such that each patrolman has approximately one-seventh of the system to maintain.

Budget Work for the State

The county is paid for the maintenance of the state highways on actual labor costs and an equipment rental based on the figures set up by the state.

A budget figure is set up each year, exclusive of snow removal, and that sum is allowed to the county for its work on state roads. For 1939 the sum of \$22,000 was allotted under general maintenance which includes weed cutting, crack filling, shoulder maintenance and the like. In addition, under the heading of "Gang Maintenance," \$4,000 was set up for patching concrete pavements, \$1,400 for bituminous shoulders on a section of U.S. 12, \$125 for daylighting a curve on Wisconsin 15, \$2,500 for seal coating on Wisconsin 120, \$700 for the same type of work on old concrete on U.S. 14 and 50, and \$1,100 for underdrains for an underpass on U.S. 14. The state also pays \$2,000 for the Patrol Superintendent who is in charge of maintenance on state and county roads.

The money for work on county roads comes from state gas tax and general property tax.

Walworth County share of 1939 gas tax.....\$ 57,101.76
County raised by direct tax.....112,414.22

Total to be spent on County trunk highway system for construction, maintenance and snow removal.....\$169,515.98

Central Garage

Because of the size and compact shape of Walworth County, only one garage is required to care for the maintenance equipment. It is located in Elkhorn and is a brick building 144 x 60 feet with two additional sheds 30 x 125 feet each for storage, a paint shed 16 x 16 feet, and another the same size for the storage of grader blades.

The main garage is equipped with small tools for truck maintenance including a grinder, grindstone, drill press, forge and gear press, and a heavy Wright wall crane and hoist running from the front to the back of the working section of the main garage. The rear is used for storage and for some small overhauling. In the front also is the



H. J. Peters, County Highway Commissioner of Walworth County, Wis.

office for the Patrol Superintendent, and above on a mezzanine is a drafting room, small-parts stock room and a platform for delivery.

The Patrol Superintendent is in (Concluded on page 19)

For Small Shovel Users with **BIG** ideas

• Just because a shovel carries a ¾-yd. dipper is no reason it can't be built to the proved principles of big machines. The Lorain-27A is the one ¾-yd. unit that gives you the economies and increased production resulting from such big machine design and quality at a cost comparable to its size.

And here's what we mean by "big." A ¾-yd. Lorain-27A shovel weighs 21,500 lbs.—handles a 16 ft. boom and 12 ft. 4 in. stick—is powered by a 6 cylinder motor designed especially for shovel service—has a Center Drive turntable providing direct-to-the-point power transmission along with utmost simplicity and strength of construction.

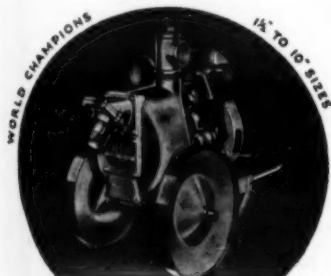
Now, take a look at the Lorain-27A dragline pictured above. Note the working angles of the boom. That's another advantage of big machine design—plenty of capacity for reaches and ranges that eliminate "straight-up" booms—and enable this ¾-yd. machine to do a real crane, dragline or clamshell job without constant moving.

Write today for catalog describing the many design and construction features of the ¾-yd. Lorain-27A. It's built for you small shovel and crane owners with big ideas.

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THE THEW SHOVEL COMPANY
LORAIN, OHIO

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LORAIN-27A



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THE JAEGER MACHINE CO.
701 Dublin Ave., Columbus, Ohio



Front view of the General Supercrane, showing the specially designed wheel mount with dual rubber tires.

New Crane Featured By Lifting Ability

A new Supercrane, recently announced by the General Excavator Co., Marion, Ohio, will lift and swing a load of 6,000 pounds in a full circle 50 feet from the machine, according to the manufacturer. A $\frac{3}{4}$ -yard unit, it is claimed to have the stability of a $1\frac{1}{2}$ -yard crane.

The basic structure of the special dual-tire wheel mounting is engineered of 20-inch I-beams running the full length of the carriage, and will support 100 tons dead weight. This special mounting is designed to provide the speed and maneuverability of a truck crane, but the Supercrane is self-propelling, requiring only one engine, one operator and one set of controls.

The alloy steel axles are 6 inches in diameter. Stout outriggers are designed as integral parts of the understructure. Extended and locked securely into position, these outriggers greatly increase the stability of the machine. They fold compactly against the sides of the understructure for transportation. Other features of the Supercrane include its ability to handle booms up to 100 feet in length, or an 80 to 90-foot boom with a 20-foot adjustable jib for "goose-necking" over walls; a fast worm-wheel-type boom hoist completely independent of swing clutches; and loads lowered through gears and under control at all times through a specially designed auxiliary precision brake. The Supercrane can hoist and swing at the same time, with two separate and

equally effective brakes on both hoisting and swinging operations. In addition, there is a special travel brake which will bring the 24-ton machine to a dead stop from top speed in about 10 feet.

A bulletin describing this Supercrane, which was subjected to rigorous tests on hundreds of jobs before it was put on the market, may be secured direct from the manufacturer by mentioning this item.

Load, Store, Batch And Mix in One Unit

The Strayer portable concrete mixing plant, made by the Erie Steel Construction Co., Erie, Pa., is fully equipped to mix concrete to exact specifications. The unit includes a bin, weighing Aggre-Meter, screw feed cement hopper, mixer, power unit, and material elevator with truck hopper, all built into a steel truck frame equipped with dual pneumatic tires, designed to conform to regulation

highway clearances.

The plant in transit is hauled behind a truck with the elevator pivoted to a horizontal position and the bin sides turned down for low overall height, the plant dimensions being 8 feet wide x 12 feet 6 inches high x 28 feet $7\frac{3}{4}$ inches long. Its weight is approximately 24,000 pounds, exclusive of ramps and truck hopper.

The Strayer plant is adaptable to large and small jobs, such as grade separations, bridges, culverts and many other types of work, and can be used with various types of concrete-placing equipment such as towers, buggies, buckets, belt conveyors, concrete pumps and agitator trucks. Depending on the required mixing time and other variable factors, the plant has a capacity for producing up to a maximum of 30 cubic yards of concrete an hour. It has all the necessary equipment to meet the most exacting specifications, such as automatic water control, weighing Aggre-Meter, and an approved mixer with standard batch meter.

Bulletin SCP-2-39, describing this portable concrete mixing plant and illustrating its use on a variety of jobs, may be secured by those interested direct from the manufacturer by mentioning this magazine.

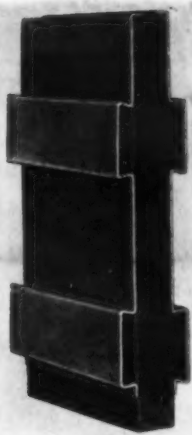
Diesel Performance Data

Seventy-eight diesel-powered machines which have operated a total of more than 1,000,000 hours are described and illustrated in a new 32-page booklet recently released by the Caterpillar Tractor Co., Peoria, Ill. Tractors, road equipment and industrial engines are included in the record-making list, and none of the machines described were hand-picked, Caterpillar states. Performance records are direct from owners, and maintenance figures have been given, where available.

Copies of this booklet, entitled "1,000,000 Hours of Diesel Satisfaction" may be secured by those interested direct from the Caterpillar Tractor Co., by requesting Form 5856.

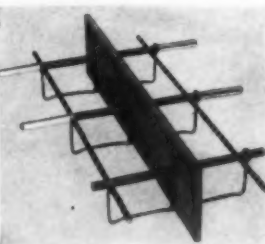
EXPANSION JOINTS by SERVICISED

1914 — 1940

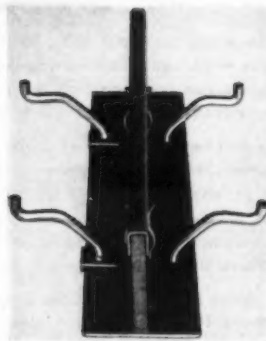


Load Transfer Plates can be made in continuous sections or individual plate sections.

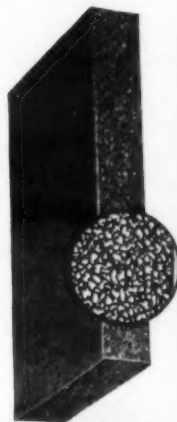
Metal Accessories to Expansion Joints include the Joint Assembly and the Bridged Load Transfer Device.



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RUBBER JOINT



The improved forms of Serviced Expansion Joints shown here are the Fibre Board, Para-Plastic Joint, Cork Rubber Joint, and the Cor-Rubber Joint.



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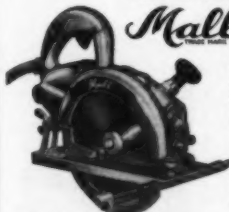
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Cutting capacities: $1\frac{1}{2}$ ", $2\frac{1}{2}$ ", $3\frac{1}{2}$ " and $4\frac{1}{2}$ "
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No contractor need be without one of these powerful, fast and efficient electric saws that handles every cutting job at a profit. They are beautifully streamlined, sturdily constructed and designed so that the greatest part of the weight rests on the long end of the board. Thus, they eliminate all blade binding near end of cut and assure a perfect balance for safe, one hand operation. Each model has spring safety guard, loop handle with built-in switch, and swivel base for bevel cuts to 45 degrees.

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7743 South Chicago Avenue, Chicago, Ill.

New Concrete Bridge Spans Henley Course

New Queen Elizabeth Way
Crosses Old Welland Canal
On 730-Foot Dual Bridges
In St. Catharines, Ontario

(Photos on page 44)

IN August, 1939, an unusual pair of bridges was completed in Ontario by The Goldie Construction Co., Ltd., of Toronto to carry the two divided 30-foot roadways of the new Queen Elizabeth Way over the upper end of the famous Canadian Henley Regatta course, which attracts more competing crews than any other rowing regatta in the world. These identical structures each have a 30-foot roadway and a 6-foot sidewalk on the outside and an open space of 22 feet between the solid steel-plate hand-rails on the inside. The outside hand-rails along the sidewalks are carried on concrete posts but have a steel grill hand-rail.

The structures each have a 67-foot partial arch between the west abutment and Pier 1, three complete 150-foot arches, another 117-foot partial arch at the east end between Piers 4 and 5 and a 50-foot concrete-beam approach span from Pier 5 to the east abutment. The design of the structures is most attractive with the thin concrete arch ribs and thin pier legs. Work was started on the south bridge on August 1, 1938, as an independent structure, leaving the north bridge until later as it was desired to have one structure open early in 1939 for spring traffic. The idea of two completely separate bridges, which are Siamese twins since they are connected at the ends by retaining walls between the pairs of abutments, was to keep traffic completely separated as on the dual-lane highway. This saved the cost of approximately 22 feet of deck for the entire length of the structures and the extra footings which would be required for this added dead load representing the 22-foot boulevard strip of the highway which carries no traffic.

Excavation and Footings

Pier 2 of the south bridge is typical of the piers of both structures and was chosen for more detailed description. A cofferdam of Lackawanna steel sheet piling was driven from a scow with a No. 9 McKiernan-Terry steam hammer, using 30 to 40-foot piles. The 15 x 42-foot cofferdam was excavated with a clam-shell, using the same stiffleg derrick on the scow that drove the coffer sheeting. The excavation was carried to 24 feet below water level in the old canal which is no longer used for navigation but is the tail race for De Cew Falls hydro station. The material excavated consisted of silt, marl and soft blue clay down to hardpan.

An area of 11 x 38 feet centered on the bottom was excavated for a key to hold the footing fast on the bottom in the hardpan. For the entire excavation, the sheeting was driven 2 feet above the lowest excavation and the forms for the

footing set inside the cofferdam. A seal 2 to 5 feet thick was poured, using a Rex single-pump Pumpcrete unit with the pipe line carried across the water on pontoons of oil drums. This was the same cat-walk used by the engineers in making the original triangulation survey for the bridge but with some drums added for the extra weight to be carried during concreting. Some of the footings were reinforced for added strength, using 7/8-inch round bars spaced 12 inches on centers both ways.

The Piers

The solid piers carry the thin-section pier legs, and the reinforcing for the arch beams is carried down into the footings through the piers to give the maximum anchorage. The designs



The completed Henley Bridge, showing the solid inner hand-rail on the two separate structures which form a link in the new Queen Elizabeth Way in Ontario.

called for special construction and care to permit the use of the light piers and pier legs. The centering for each arch beam was required to be left in place until the adjacent arch had been poured plus ten days. The piers are "dumbbell-

shaped" in cross section with rounded noses and are approximately 30 feet in height.

The forms for the piers were made up in panels 6 x 10 feet with 1 1/8 x 7-inch

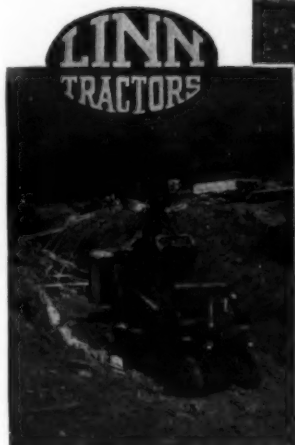
(Continued on page 20)

MAKING HAULAGE HISTORY

ON THE PENNSYLVANIA TURNPIKE



Here are two LINNS owned by N. R. Corbisello, working at Clear Ridge, the deepest cut on the Turnpike. LINNS also were used on other sections of this vast project by Connell and Laub, George Yang Inc., and Corrado and Galliardi.



"Take no chances on haulage" was Corbisello's policy when he started that 1,150,000 yard rock and earth cut on Section 13E. Excavating must go forward every day, no matter what the weather, footing or grades! So haulage in the tough spots was assigned to his LINNS. He knew from experience that LINNS would keep shovels active and earning every hour of every day, by maintaining haulage schedules without interruption. He knew, too, that costs would be low . . . because of LINN'S power, its exclusive flexible traction, and its huge payload carrying capacity. >>> On any job, the best way to insure meeting time and profit schedules is to put the tough haulage problems up to LINN. Let us send full particulars on LINN'S high speed, exclusive flexible traction which enables it to master weather and grades, and other exclusive LINN features. Write to Morris today.



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Roanoke, Virginia
San Francisco, Calif.
Sioux Falls, S. D.

Skowhegan, Maine
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Worcester, Mass.

Full Face Operations At the West Heading

(Continued from page 2)

east portal was Gunited to hold the rock, the dry material being chuted from the dry mixer at the top of the hill.

The West Heading

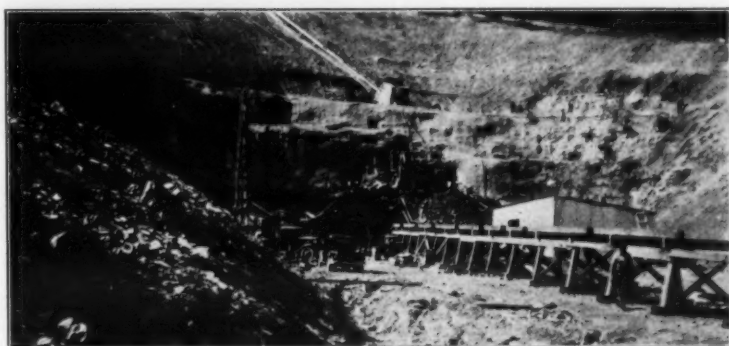
About 400 feet of double-track tunnel and 400 feet of single-track tunnel had been driven by the South Penn contractors, so that on Contract 13 of the Pennsylvania Tunnel Commission it was necessary for the Hunkin-Conkey Construction Co. only to enlarge these sections and then the work was carried on full face in good rock.

Drilling was done from two jumbos mounted on old Sterling motor trucks, equipped with dual pneumatic tires at the rear. At each set-up a temporary platform was built across between the two for placing steel and lagging. The jumbos were built up of a welded pipe frame and cross braces. Four Ingersoll-Rand DA-35 water drills were operated from each jumbo, with an extra one attacking the odd corners. In drilling, the full face included a 20-foot vertical section and a 5-foot rise for the arch, the whole being 32 feet wide. A round was drilled with 64 holes, using six V cut holes and two baby cut holes. The depths of rounds were 7, 9 and 11 feet, depending on ground conditions.

Although the quality of the rock varied somewhat in the first 500 feet of the tunnel, after it had been driven 1,000 feet a good solid sandstone which was not too hard to drill was met. In all, 10 delays were used for most of the shots in hard rock at the west heading of Laurel Tunnel, using 40 per cent Hercules dynamite and fired off the 440-volt line. Both the tunnel and the jumbos were well lighted as a safety measure, and to aid in speeding up operations.

All of the mucking was handled by a Lorain 1¾-yard 440-volt electric shovel loading to rebuilt Western 5-yard dump cars, handled by a rebuilt diesel-powered locomotive. Single track was used for the work with a run-around to handle the empties. To speed up mucking at the face, a Caterpillar D4 with a La-Plant-Choate bulldozer rustled the rock for the shovel.

The water, air and light lines were



C. & E. M. Photo

Early stages of work at the east portal of Laurel Hill Tunnel on the Pennsylvania Turnpike, with the three adits and, in the foreground, the low-grade trestle for handling muck.

brought in on the left of the tunnel, facing the heading, and the firing line carried in on the right. The shovel had its own 440-volt line, carefully carried along the side of the tunnel, well insulated from the steel ribs. The lighting

of the tunnel was with 50-watt bare incandescent electric lights spaced 25 feet apart. The air line was a 6-inch steel line with couplings run close to the face, and a 2-inch water line was also carried in to the jumbos. To furnish

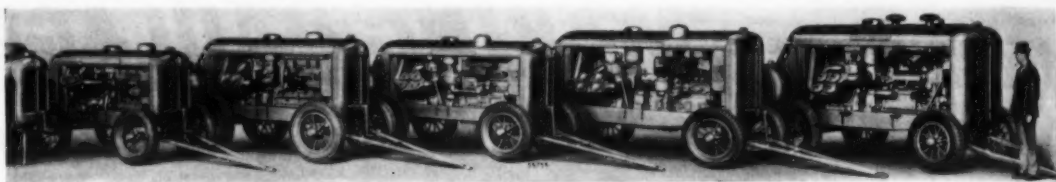
ventilation for the tunnel, a 10,500-cfm Sturtevant blower delivered air to a 24-inch spiral-weld pipe as far as the portal, and from that point 24-inch Ventube was used up to the face. The blower was driven by a 30-hp Westinghouse motor through a V-belt drive.

Steel Ribs and Lagging

For the first 250 feet of enlargement, 8-inch 18.4-pound I-beam ribs were used, spaced 1 foot on centers at the portal where the rock was very poor, and finally on 4-foot centers as the character of the rock improved. A 2-segment arch of curved I-beams with individual posts was used. Following the first 250 feet was 500 feet of hard rock in which the steel was not erected for some time, and then the contractor went back and placed the steel on the standard 4-foot spacing.

At the face, as protection against a possible fall of rock from the roof, the contractor cantilevered three 10-foot 8 x 8 timbers over the top, carrying them 5 feet out over the back and maintaining

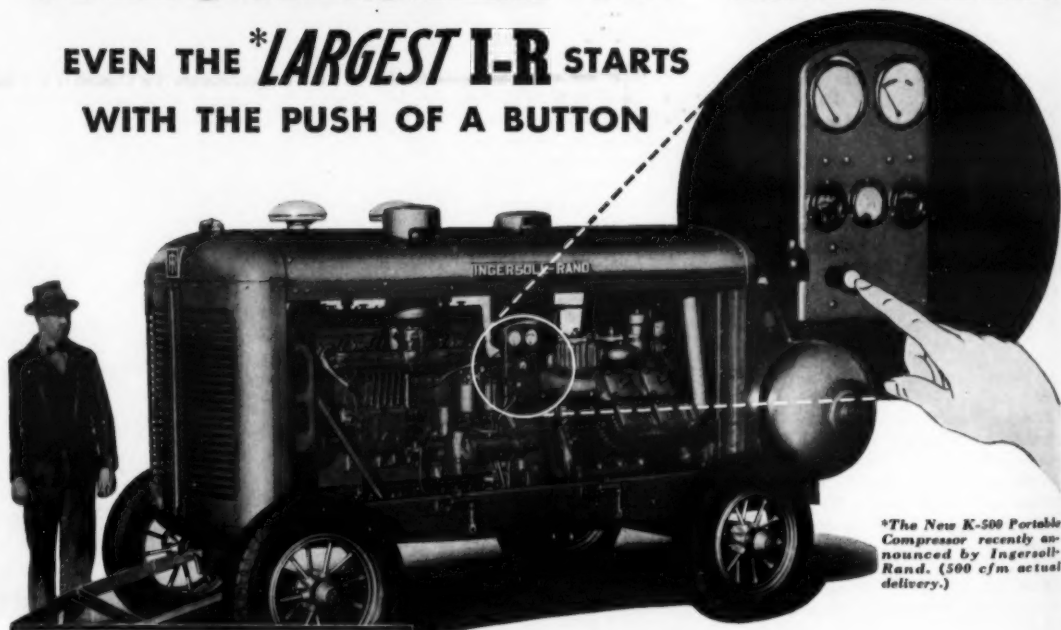
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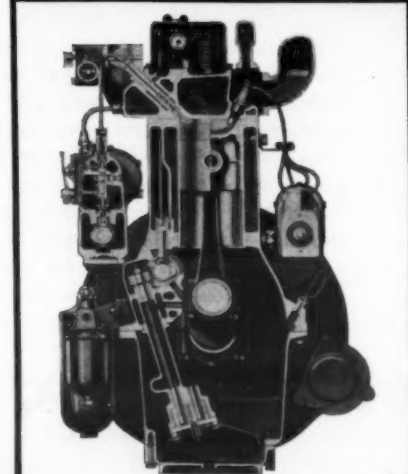
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*The New K-500 Portable Compressor recently announced by Ingersoll-Rand. (500 cfm actual delivery.)



WAUKESHA ENGINES Power
ALL I-R Portable Compressors

● The easiest, and quickest, starting oil engine in the world. That's what operators say about the Waukesha Oil Engine in the Ingersoll-Rand Compressor.

What's the secret of this quick, easy starting? Low compression and spark ignition. The engine requires only a standard battery electric starter. Smaller sizes are easily and often hand-cranked.

No auxiliary starting engine is needed with the Waukesha Spark Diesel Engine. It is not like the usual small-bore, compression ignition Diesel which requires a complete auxiliary gasoline starting engine with an extra clutch and transmission. With Waukesha there's only one engine to warm up.

A convenient primer atomizes and sprays a small charge of gasoline into the intake manifold. The fuel is quickly vaporized. The engine starts instantly. As soon as it fires it begins to function on fuel oil—without any auxiliary change-over mechanism whatever. Even in the coldest weather it needs no more priming than a gasoline engine. A Waukesha warms up on fuel oil.

All I-R Two-Stage Air Cooled Portable Compressors have Waukesha Power Plants—whether gasoline engine or oil engine powered. Write for Bulletins 1135 and 1138.

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NEW YORK TULSA LOS ANGELES



A 1½-yard Lorain diesel-powered shovel is in the foreground, and a 2-yard Lorain is working on the approach to the east portal of Laurel Hill Tunnel, for which Hiaman Bros. of Denver, Colo., was the subcontractor.

Laurel Hill Tunnel On Penna. Turnpike

(Continued from preceding page)

them well lagged and blocked for two rings back. These timbers would break almost any fall of rock which might cause injury to men working below on the drills, or during mucking.

The Compressor House

In a temporary galvanized-iron building the contractor housed three Sullivan 600-cubic foot air compressors, equipped with 100-hp General Electric motors, and a single Gardner-Denver 600-cubic foot compressor with a Westinghouse 150-hp motor, all driven through belt drives. Two air receivers in tandem were located immediately outside the building. Adjacent to this was a machine shop for the complete maintenance of all equipment used on the job, provided with a Hobart electric welder, a power hack-saw, power drill press, a Queen City grinder and a Massco grinder for Jackbits. The contractor bought 2 ¾-inch bits and ground them down to 1 ¾-inch in four or five grindings before they were discarded.

Aggregate Production and Storage

Hunkin-Conkey Construction Co. began crushing its own aggregate for tunnel lining soon after the actual tunnel operations were started. The quarry was located ¼-mile haul from the west

portal, where a well-planked side-hill storage area was set aside for stockpiling 300 tons of stone and some 20,000 tons of sand.

Personnel

On Contract 13, for the driving of the Laurel Hill Tunnel on the Pennsylvania Turnpike, W. M. Bennett was General Superintendent for Hunkin-Conkey Construction Co. of Cleveland, Ohio. For the Pennsylvania Turnpike Commission, E. R. Dinkle was Resident Engineer.

Portable Gasoline Hammers

The Barco portable gasoline hammer is a one-man tool for breaking concrete, backfill tamping, drilling, rock breaking, tamping, driving sheeting, and similar work. It is adapted to all kinds of jobs in all types of weather, and is easy for the average workman to operate.

Copies of Booklet 603, describing and illustrating the various types of work for which the Barco power hammer is designed, may be secured by interested

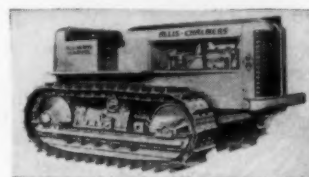
contractors and state and county highway engineers direct from the Barco Mfg. Co., 1801 Winnemac Ave., Chicago, Ill., by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

New Diesel Tractor

The New HD10 diesel crawler tractor just announced by the Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis., is designed as a companion model for the HD14, the first of this new line for 1940.

Features of this new tractor are its General Motors 2-cycle diesel engine, Velvetouch bi-metallic steering clutches and brakes, and Positive-Seal truck wheels. The machine is built complete with extra-heavy crankcase, radiator, truck wheel guards, muffler, hour meter, adjustable radiator shutters, bumper, front pull hook, and electric starting and lighting as standard equipment.

The 4-cylinder diesel engine provides 95 belt hp and 79 drawbar hp, with drawbar pulls up to 18,430 pounds. The



The new A-C HD10 diesel tractor.

tractor is available in two tread widths, 62 and 74 inches, with the narrow model weighing 19,900 pounds and the wide model, 20,700 pounds. Constant-mesh gears permit shifting during travel, with six speeds forward and two reverse. Because the engine can be throttled down to almost half speed without losing drawbar pull, the manufacturer states that a speed range from 1.69 to 6.03 mph is available.

The HD10 is designed to handle two and four-wheel scrapers up to 10-yard capacity, 12-foot blade graders, bulldozers, trailbuilders, winches, and similar equipment.



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right-to-the-point descriptive stories on each. It takes into consideration the fact that every gravel pit is different; that every deposit varies. It is a guide. It gives you today's trends—what's been going on in equipment development. It shows you how to get the most out of your pit—in the most efficient, most profitable way. It's free! Ask for Telsmith Gravel Plant Book GP-34.

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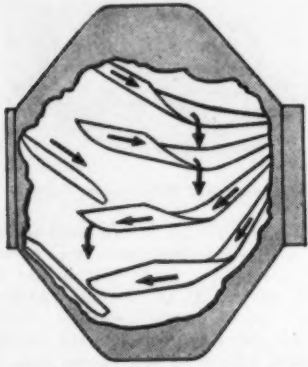


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CEMENT BOXES**

• Boxes placed against front of batch compartments. Lid remains permanently tight until easily opened by spotter. Discharges all the cement at right time—in perfect condition. Reduces labor costs. Speeds up delivery of batch to mixer.

Write Today FOR DESCRIPTIVE FOLDER & PRICES

**THE STEVENS METAL
PRODUCTS CO.**
NILES, OHIO



The new MultiFoote cone drum, showing the movement of materials.

The Mixing Action Of New 1940 Paver

The mixing action of the cone drum in the 1940 MultiFoote pavers is speeded up by a new type of blade, giving faster charging, faster mixing and faster discharge, according to the manufacturer. It is stated that the new double-cone drum will deliver 45-second concrete equal to 60-second mixed concrete from a cylindrical drum.

The newly-designed buckets spill a part of their load to the bucket below, which, due to its curved form, turns its individual portion of the mixture over. The result is a continued end to end and rolling motion of material, which thoroughly coats all aggregate with cement. The double-cone construction of the drum leaves it free from corners. These drums are made of two heavy-pressed steel sections, welded together at the center with a heavy butt strap. The roller paths on the machine and the double drive gear, in conjunction with the fact that the load is always carried in the center, give more even running. The mixing blades are of high carbon steel, assuring long life and the drum openings have renewable wearing rings. The drum rolls on machine-faced rollers, mounted on Timken bearings.

Other features of the 1940 MultiFoote 27-E paver, which facilitate putting the concrete on to the road, are described and illustrated in detail in a 26-page bulletin which may be secured direct from The Foote Co., Inc., Nunda, N. Y., by mentioning this text.

New Gas or Electric Pavement Breakers

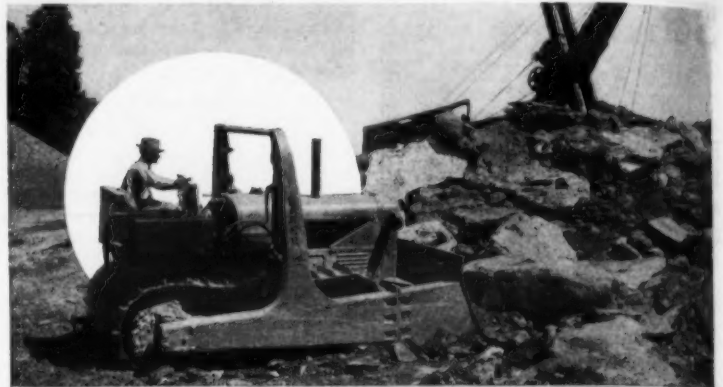
The new Master twin-piston pavement breaker is an 85-pound tool designed for breaking concrete and general demolition work, for backfilling, digging frozen ground, shallow drilling, rock breaking, driving sheeting, road rail stakes or spikes, form tamping and many other uses.

Constructed of alloy steels on a new principle of operation, utilizing the features of a pneumatic hammer, these breakers are adapted to mechanical power drive through a flexible shaft. There is no direct connection between the twin floating pistons and the power input. Power is furnished by a Briggs & Stratton 4-cycle gasoline engine, complete with gasoline strainer and oil bath cleaner, and equipped with a carrying

handle, or by a Master Model 200 electric power unit which is an all-aluminum-cased gearhead motor, lubricated for life and mounted on a stamped steel swivel base, equipped with a carrying handle and 25 feet of heavy-duty extension cord. A pressed-steel swivel engine base allows free swiveling action of the power unit, and is mounted on a wheelbarrow of tubular construction equipped with a pneumatic intertube tire.

The feature of this tool is the full floating twin piston. The piston operates at 1,200 rpm which provides 1,200 blows a minute. The breaker is lubricated by two lubricating systems located in each handle of the breaker. The tool head accommodates a 1 1/8 x 6-inch hexagon shank to the collar and any normal length of tool steel or any standard tool with these specifications.

Complete details will be found in a new bulletin, Form 184, copies of which may be secured direct from the Master Vibrator Co., Dayton, Ohio.



BAKERS TAKE JOBS AS THEY COME

Ask for Bulletins on
BAKER

BULLDOZERS, SCRAPERS,
GRADEBUILDERS, MAINTAINERS, ROAD DISCS, ETC.

The Baker Mfg. Co. 585 Stanford Ave., Springfield, Ill.

MODERNIZED POWER LUBRICATION

On The Job!

Alemite Motor Oil Dispenser services crank cases direct from original drum.

Rigid drum supports prevent vibration or shifting when going over rough ground.

Alemite Low Pressure Barrel Pump services final drives and transmissions, direct from drum.

CHECK THESE FEATURES

Air hose for inflating tires and air-cleaning.

Alemite Volume High Pressure Barrel Pump services all high pressure fittings direct from original drum.



Pays For Itself in Days!

By providing better lubrication faster—by reducing "time out" for repairs due to faulty lubrication—by enabling you to move more yards of earth per day per machine—Alemite Portable Service Stations pay for themselves quickly, and return a handsome profit for years!

Here are some of the amazing results others are getting: Transmissions and

final drives filled at the rate of 14 lbs. per minute—tractor track roll bearings lubricated in seconds—all high pressure fittings dependably serviced in a hurry—direct from original drums! Motor oil is delivered to crank cases, also direct from the original drum. And there is ample air for inflation of tires and for air-cleaning.

This illustration shows the standard

model with Alemite Volume High Pressure Barrel Pump, Alemite Low Pressure Barrel Pump, Alemite Oil Dispenser, and the fourth reel for the air hose. However, the idea is flexible: You can have your own Alemite Portable Service Station made to your own special requirements! Alemite's experience is yours for the asking! Mail the coupon today for complete details!

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EXPANSION JOINT
Standard in Concrete Construction for 25 Years
ECONOMICAL and EFFICIENT
Asphalt Joint • Rubber Joint
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INDUSTRIAL LUBRICATION
ANOTHER STEWART-WARNER PRODUCT

Santee-Cooper Dams In South Carolina

Diversion of Waters Will Provide Power As Well As Navigable Route from Charleston to Columbia

By HOWARD F. PECKWORTH,
PWA Resident Engineer-Inspector, Santee-Cooper Project, South Carolina

(Photo on page 1)

THE Santee-Cooper power and navigation development now under construction on the coastal plain of South Carolina in Berkeley, Clarendon, Orangeburg, Calhoun and Sumter Counties, and consisting of Santee Dam and reservoir, a diversion canal, Pinopolis Dam and reservoir, and Cooper River tailrace, had its beginning some century and a half ago when Charleston business men began to think about an inland water route between the coast and the interior. In 1786 a charter for the Santee Canal was granted by the State Legislature, and the waterway was designed and its construction supervised by Colonel John Christian Senf, a distinguished Swedish engineer and soldier who fought for the colonies during the Revolution. The canal was finished in 1800, and was in use until 1850 when the advent of the railroads provided too much competition for it.

About 25 years ago, the difference in the elevation of the Santee and Cooper Rivers directed the attention of hydraulic and electrical engineers toward a power development, and in 1934 the South Carolina Public Service Authority was created as sponsor for the Santee-Cooper power and navigation project, although work on the development did not start until 1938.

Santee Dam will impound the Santee River, and a canal will divert the water across a low watershed into the Cooper River basin where Pinopolis Dam will impound it at Broughton Hall Creek. Here the 75-foot lift navigation locks and power plant will be built. The tailrace from Pinopolis Dam will be dug to the Cooper River so that the water originating in the Santee River will eventually flow down the Cooper River past

the city of Charleston into the Atlantic Ocean. This flow will supply navigation facilities from Charleston to the Santee and on up to Columbia, S. C., and furnish electric power at the site of Pinopolis Dam.

The whole project is divided into about thirty-four different contracts which cover the work to be done, from the underground explorations to the construction of Pinopolis and Santee dams, the diversion canal, the tailrace canal, and the various contracts for tur-

bines, generators, riprap, dikes, power house, lock and the machinery connected therewith. The work on some of these contracts will be described in subsequent articles.

Santee Dam

Santee Dam is divided into three sections, North Santee, South Santee and Spillway dams. North Santee Dam and Spillway Dam will be approximately 4.3 miles long, extending from the Santee River, the length of the spillway, across Black Oak Island, Little River and the Santee swamp to the north end. This section of Santee Dam will be about 45 feet high above the ground surface and will be constructed of sand fill placed by hydraulic dredge.

(Concluded on page 39)

New Wire Rope Booklet

A handy-size wire rope booklet describing the construction and various types of Hazard Lay-Set preformed and Nonparell non-preformed wire rope has recently been issued by the Hazard Wire Rope Division, American Chain & Cable Co., Wilkes-Barre, Penna. Devoted mainly to the wire rope used on road-building equipment, this booklet is featured by a center spread in the form of a table of recommendations of the proper type and grade of wire rope to be used on various types of equipment.

Copies of this booklet may be secured by interested contractors and engineers direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.



Spotting water Mains without manual aid is proof of Marion's fraction-of-an-inch control

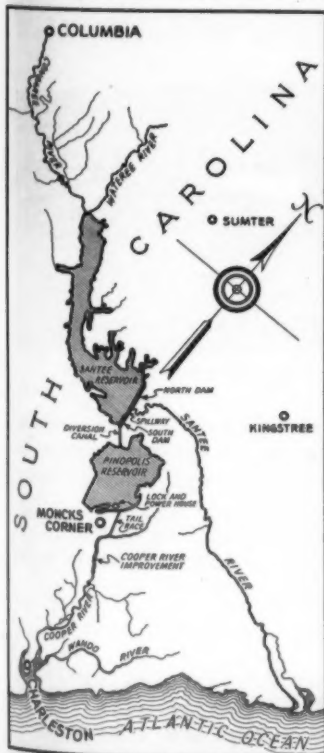
The Marion 362 loads trucks as rapidly as they can haul the loads away

Marion 362 — 2 cu. yd. Pull-shovel lowers a 6½ ton, 16' x 42" pipe into trench

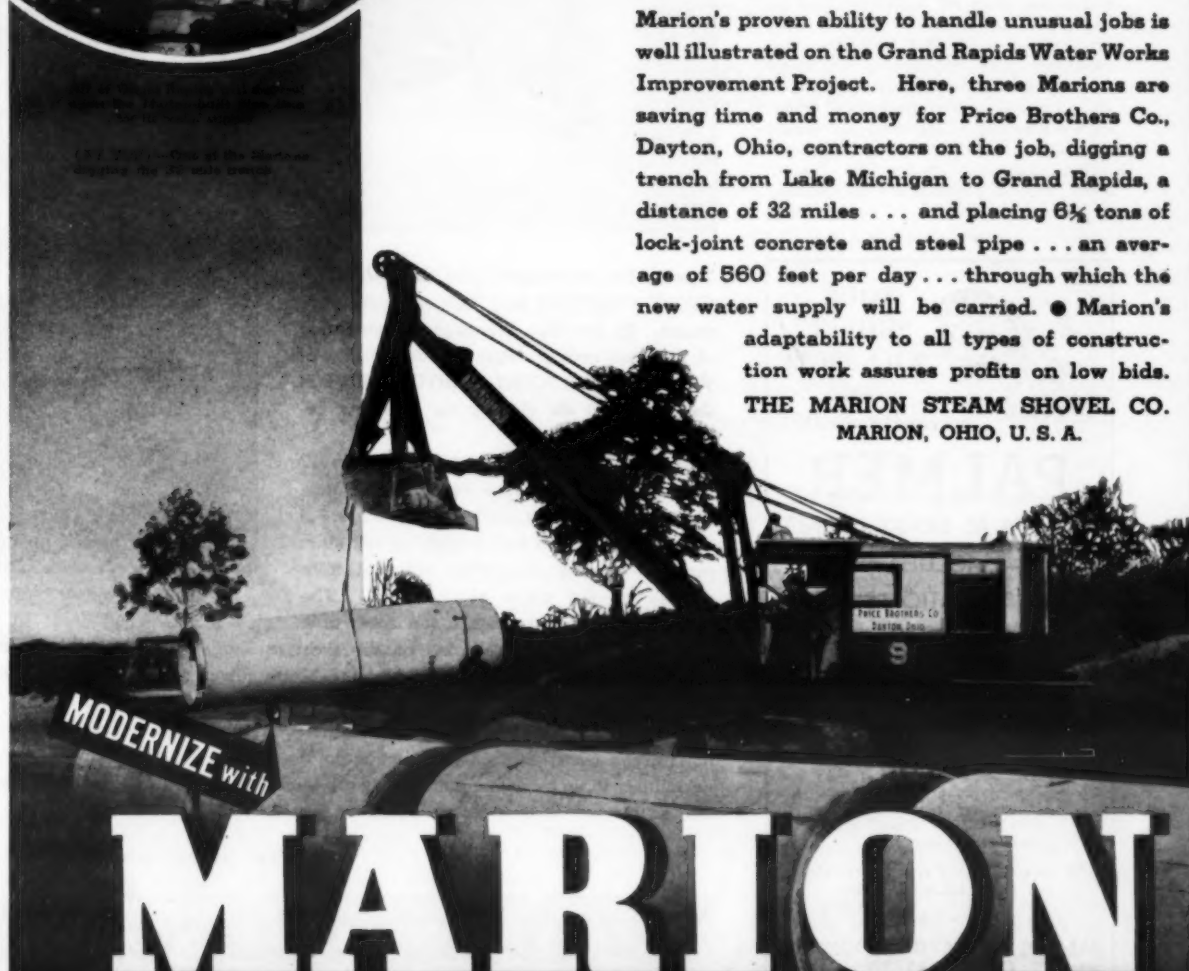
3 MARION PULL-SHOVELS TRENCH and LAY 32 MILES of PIPE LINE

Marion's proven ability to handle unusual jobs is well illustrated on the Grand Rapids Water Works Improvement Project. Here, three Marions are saving time and money for Price Brothers Co., Dayton, Ohio, contractors on the job, digging a trench from Lake Michigan to Grand Rapids, a distance of 32 miles . . . and placing 6½ tons of lock-joint concrete and steel pipe . . . an average of 560 feet per day . . . through which the new water supply will be carried. ● Marion's adaptability to all types of construction work assures profits on low bids.

THE MARION STEAM SHOVEL CO.
MARION, OHIO, U. S. A.



Map of the Santee-Cooper power and navigation project in South Carolina.



MODERNIZE with

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SHOVELS • DRAGLINES • CLAMSHELLS from ¾ cu. yd. to 35 cu. yds.
CRANES • PULL SHOVELS • WALKERS



The Lima Type 750 dragline equipped with a 2 1/4-yard bucket.

New Shovel-Dragline Has Many Features

The Type 750 shovel-crane-dragline, made by the Shovel & Crane Division, Lima Locomotive Works, Inc., Lima, Ohio, has a number of improvements and new features which the manufacturer states are designed to provide high-speed low-maintenance operation. As a shovel, this machine is equipped with a dipper of full 1 3/4-yard capacity with a 22-foot boom and a 17-foot dipper handle. For dragline service, booms ranging from 50 to 80 feet are available, the size of the bucket depending upon varying conditions. Cranes are also equipped with booms from 50 to 80 feet.

Power is furnished by a 6-cylinder heavy-duty gasoline engine, with provision for the installation of a diesel or oil engine or an electric motor, if desired. The truck frame is a one-piece steel casting thoroughly annealed, with all supports and gear case cast integral. The cab is of all-steel construction, with a removable glass winter front and extra-wide doors for ample ventilation in hot weather.

Steering is accomplished through a hand wheel at the operator's right, and is possible with the rotating frame in any position. The boom hoist is independent of all other motions, thus affording quick response to any boom angle. A power dipper trip is built into and is a part of the machinery, relieving the operator of all effort in tripping the bucket. Hoist clutches are equipped with vacuum assistors for ease of operation, and all clutches are independent so that it is possible to hoist, swing,

travel, and raise or lower the boom simultaneously. The drums are of extra large diameter and are of sufficient width to carry the maximum amount of cable required without double wrapping. The brake bands, of sufficient diameter to assure easy operation and afford long life to the lining, are made

in two parts to facilitate easy removal when necessary. Helical gears are used throughout the main machinery.

Features of 1940 Asphalt Distributor

The Littleford Spray Master pressure distributor for bituminous materials has a number of features. The full circulating folding spray bar which folds in the center is equipped with a suck-back device, providing thorough drainage. The hydraulic spray-bar lift enables the operator to adjust the height of the bar to any distance he desires from the road surface. In addition, the bar can be shifted sideways and yet remains in a horizontal plane. When raised and lowered, the nozzles always remain in a position perpendicular to the road surface.

Another feature is the air-cooled flue liner, an engineered feature designed to keep the flue cool. The motor on this distributor is mounted on the front for

better load distribution, and the pump is mounted in the rear, making the pipe lines shorter. The single-valve control is standard on all Littleford pressure distributors.

These distributors are made in sizes from 500 to 3,000 gallons, in truck-mounted or semi-trailer types. Complete information may be secured direct from Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio.



Complete Line of DERRICKS and WINCHES

SASGEN DERRICK CO.
3101 W. Grand Ave. Chicago, Ill.

What does a WALTER SNOW FIGHTER do when there is no snow?



This is just to remind you that WALTER SNOW FIGHTERS pay their way the year round. In the fast, thorough maintenance of dirt and gravel roads the superiority of WALTER FOUR-POINT POSITIVE DRIVE is demonstrated as clearly as in snow removal.

The Walter Center Scraper Blade is 12 feet long and 14 inches high, with renewable highway standard cutting edge. It can be shifted two feet to right or left side, making it easy to gather material from ditches or the edge of the road. The hydraulic control provides a separate valve and lever each for the rams on the right and on the left sides, so that either end of the blade may be lowered or raised as necessary. This control, combined with the Walter push frame construction, gives great flexibility of action to the blade, permitting it to be tilted either way at about a 15 degree angle. This feature is also a considerable



View of blade from rear, showing push frame construction

help in gathering road material from the ditches. A smooth cutting action on any road surface is assured by the fact that the blade can be swung readily to any desired working angle, right or left side, and its pitch easily adjusted by means of the special spring-cushioned adjusting rods on each side.

Send for further information

WALTER MOTOR TRUCK CO.

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YOUR
SHOVEL
WILL SMILE
—when
equipped with

PALMER
INDUSTRIAL BRAKE LINING
— MOLDED —
BRAKE & FRICTION BLOCKS

With Palmer Brake Lining and Blocks installed, your operations are not slowed down by uncertain, slipping brakes or clutches; renewals with their attendant labor costs and tie-up of equipment are infrequent; in short, you are assured of the most satisfactory braking performance that the best material of an experienced manufacturer can give.

The correct size and type for any make and model industrial machine.

Write for information

PALMER ASBESTOS & RUBBER CORPORATION

190 N. Michigan Avenue, Chicago, Illinois

Concrete Walls and Riprap Protect Scenic Mohawk Trail

C. J. Maney & Co. Poured Gravity-Section Walls, Placed Heavy Riprap and Excavated River Channel

(Photos on page 44)

† TO protect the scenic and heavily-traveled Mohawk Trail along the northern border of western Massachusetts from damage by a repetition of the flood in the Cold River following the hurricane of September 21, 1938, closing the Trail to traffic for weeks, heavy concrete walls and grouted masonry were hurried to completion. The hurricane hit the Mohawk Trail around Charlemont, Mass., about 5 p.m. and high water hit the section between Charlemont and Florida about 7 p.m., washing out sections of the highway, cutting back of a town bridge and filling the well-defined channel with debris, large gravel and boulders.

The contract for channel excavation, concrete walls, and riprap in the Cold River extended for 5 miles along Massachusetts Route 2, "The Mohawk Trail," within which distance the stream crosses the highway once.

The Concrete Retaining Walls

A total of 25,000 cubic yards of Class C concrete was poured in eight large-section and two small-section retaining walls, the former being chiefly at bends of the river. The walls are uniformly 2 feet wide at the top, with a 4-inch to the foot batter on the front, a variable batter on the back slope, and a footing 2 feet thick extending 1 foot beyond the base of the wall front and back. The width of the wall at the bottom is 0.7 of the vertical height. The footing is sloped back from the front of the wall 1 foot in 12. The walls carry a surcharge of backfill generally sloped at $1\frac{1}{2}$ to 1.

The longest section of wall is 2,300 feet in length in the Town of Savoy and includes the section shown in the photograph on page 44, taken at Station 403. The walls vary in height from 14 to 26 feet, although one of the smaller sections is only 8 feet high, acting more as a toe wall for heavy grouted riprap.

The forms for the walls were made up with $\frac{5}{8}$ -inch plywood on the front and usually the same material on the back of the wall, in 8 x 4-foot panels, with

2 x 6 rangers and studs. These panels were used over repeatedly, effecting a great saving in the cost of form material.

The same equipment mentioned below as used for channel excavation excavated the wall trenches in the loose gravel. These trenches were pumped dry during the work by a group of self-priming pumps including a 4-inch Myers centrifugal, two 6-inch Sterling centrifugals with Waukesha motors, a Marlo double-diaphragm pump and 4-inch Gorman-Rupp with Hercules power.

Transit and Paver-Mixed Concrete

The Class C concrete used for the re-



C. & E. M. Photo

A B-E 37-E completing channel excavation.

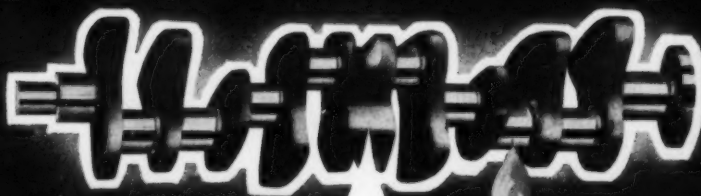
taining walls was partly mixed at the site in a Koehring 27-E paver, using a 6-bag batch and a $1\frac{1}{4}$ -minute mix, and partly in Jaeger truck mixers from a batching plant at the Boston & Maine Railroad station in Charlemont, 5 miles from the end of the job, requiring a 5-mile maximum haul. The transit-mixed concrete

was furnished by The Whittemore Co. of Boston, which set up its Erie Aggre-Meter batching plant where both aggregates and cement were batched by weight, the plant delivering a 19-bag batch direct to the big transit mixers.

For the 27-E paver, the sand and stone

(Continued on page 36)

Would you lubricate the bearings?



Then Lubricate WIRE ROPE!

(IT HAS A THOUSAND
"BEARINGS" PER FOOT)

A wire rope is a machine and should be so treated.

Every component wire bears upon its adjacent wires and in operation they slide and rub against each other. Just as the crank-shaft bearings in your automobile need lubrication, so do these multiple bearing pressures in wire rope.

A penetrating wire rope lubricant properly applied forms a film even on the inner wires and keeps those invisible "bearings" from wearing or corroding. It adds greatly to the life of your ropes, drums and sheaves, and contributes materially to rope safety.

TRU-LAY Preformed rope and the proper lubricant are a perfect team to obtain maximum rope service and economy.

An American Cable Division representative will gladly assist you with your lubrication or other rope problems.

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WILKES-BARRE, PENNSYLVANIA

In Business for Your Safety

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AMERICAN CHAIN & CABLE COMPANY, Inc.

Are You Tired of Pump Headaches?



Marlow Pumps give continuous and genuine satisfaction. Sizes $1\frac{1}{2}$ " to 10" self-priming centrifugal. Also diaphragm and plunger pumps.

Ask for Bulletin CEM-42

MARLOW PUMPS
Ridgewood New Jersey



C. & E. M. Photo
Reducing oversize rock on fill by the skullcracker method, using a Byers crane and a 3,700-pound ball.

A 60,000-Yard Cut Was Largely Ledge

(Continued from page 2)

receiver, an old boiler, mounted on skids. Using Timken detachable bits, the wagon drills sent down their holes 18 to 20 feet which, after cleaning, were loaded with 40 to 60 per cent National Powder Co. ammonia gelatin and fired from a 1,500-watt 110-volt Kohler portable electric plant. The detachable bits were not sharpened on the job but were shipped to Philadelphia for grinding.

Moving the Rock

The well-shattered hard rock was loaded by a 2½-yard Northwest shovel with a manganese bucket into three 12-yard Euclid trucks, and two 10-yard Athey crawler wagons pulled by D8 tractors. The average haul for the rock was from 800 to 900 feet to the fill, where the stone, which had to be a minimum of 18-inch dimension, was spread in a 24-inch layer, pushed into position by a D8 tractor with a LeTourneau bulldozer, and rolled with a Buffalo-Springfield 10-ton roller. Considerable economy in loading the hauling units was effected by spotting them on both sides of the shovel so that a truck or crawler wagon was waiting on the opposite side as soon as one unit was loaded.

York Engineering Co. was one of the contractors using the skullcracker method of reducing oversized rock to specification size for the fill. A Byers crawler crane with a 3,700-pound skullcracker managed to crack the hard rock pretty quickly and bring it within the specified size. It was a bit dangerous to be within 30 or 40 feet of the skullcracker because splinters of the rock were quite well scattered by each blow. There were also two men hand-sledging rock along the edge of the fill.

For lighting the job for the night shift, as it was operated three 8-hour shifts, two Kohler 1,500-watt light plants were used. One of these was kept on the excavation and, as mentioned above, was used to furnish the electricity for blasting, and the second was on the fill.

Personnel

On this contract John Weidman was Superintendent for York Engineering Co. of York, Penna., and Earl Morris was Resident Engineer for the Pennsylvania Turnpike Commission.

New Timken Appointments

Yale D. Hills, who has been associated with the Timken Roller Bearing Co., Canton, Ohio, since 1919 and for nine years held managerial positions on the west coast, has been appointed Assistant General Manager of the Service-Sales Division of that company. Prior to this appointment, Mr. Hills had returned to the Canton office as supervisor of distributors.

J. F. Cornell, Branch Manager of the Minneapolis Branch of the Service-Sales Division of Timken will take the position of special representative of the company, with headquarters at Canton. Cornell has been replaced by J. P. Roberts, who has been connected with the Pittsburgh office as a salesman.

STERLING BALANCED WHEELBARROWS



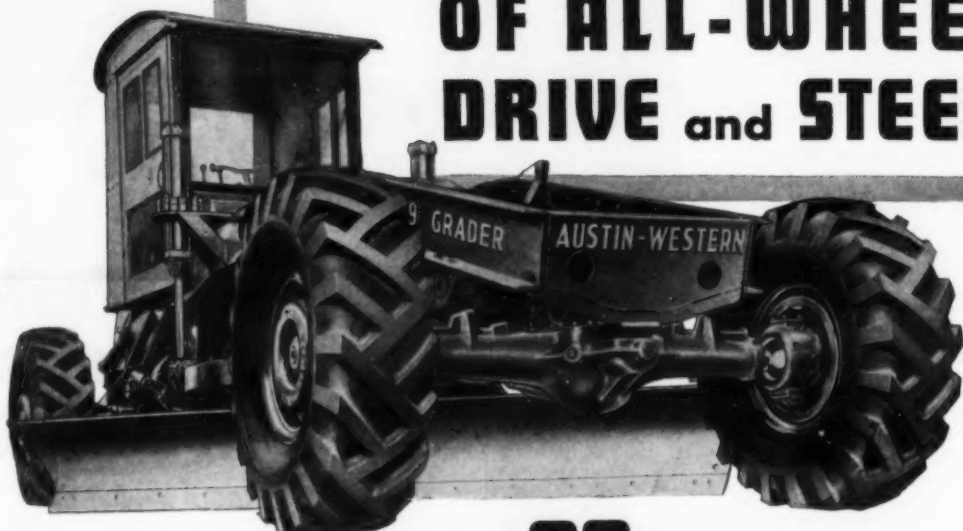
1 1/32" dia., continuous butt-welded rod in top edge of trays. Double thickness of metal at tray laps crimped over rod.

NO. S-18 CONCRETE BARROW WITH PNEUMATIC TIRE WHEEL

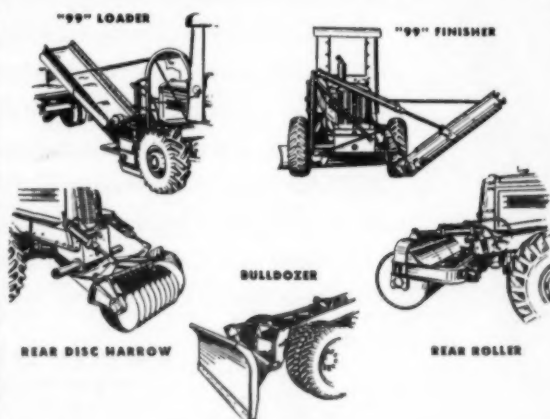
A COMPLETE LINE OF STERLING WHEELBARROWS AND CONCRETE CARTS

STERLING WHEELBARROW CO., MILWAUKEE, WIS.

TEAMWORK OF ALL-WHEEL DRIVE and STEER



...GIVES THE "99" THESE EXTRA USES



• There's no compromise with quality of work or economy of performance when the A-W "99" Power Grader is used for Loading, Finishing, Scarifying, Discing, Rolling or Bulldozing. Due to All-Wheel Drive and Steer, a "99" has the power, traction and maneuverability to handle such jobs with the efficiency heretofore obtainable only from a specialized machine. And, remember, all of these jobs are plus values! The "99" is a real "buy" on its superior ability in handling heavy ditching, rough grading, maintaining and other specific power grader jobs. It operates closer to culverts, bridges and other obstructions. It cuts down banks faster. It moves larger windrows farther. It plows deeper. It keeps going regardless of weather or soil conditions. Try out a "99" at the first opportunity. Its power and practical versatility will convince you that your next power grader MUST have All-Wheel Drive and Steer. THE AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Illinois.

Do you wish a really superior dumping unit for handling 2-cu. yd. Detachable Buckets?
SEE OUR MODEL LF
(Load Forward)

DEMPSTER DUMPSTER

For any 1½-ton truck
NO COUNTERWEIGHT OVERHANG SIDESWAY

All the load on the chassis
DEMPSTER BROS. INC. Knoxville, Tenn.

Motor Graders • Blade Graders • Crushing and Screening Plants
Elevating Graders • Rollers
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Cable Scrapers • Motor Sweepers • Bituminous Distributors

AUSTIN-WESTERN

Clean Free Subgrade Aid to Fast Paving

**Edw. M. Rocho Runs Paver
On Shoulder Leaving Ample
Space for Steel and Joints
On Job at Eldena, Illinois**

(Photo on page 44)

WHEN it is possible to run the paver on the shoulder or on an adjacent strip of concrete in pouring a concrete road, a contractor saves in every way. The steel and joint men have the subgrade to themselves in front and behind the paver because the fine grade crew has completed its job well ahead, and the batch trucks are not given a chance to cut up the subgrade close to the paver, causing no end of adjustments because of low or high grade just when the concrete should be going down.

This was particularly well demonstrated on a 6.51-mile contract for 22-foot concrete pavement running east and west through Eldena in northern Illinois this past summer by Edw. M. Rocho of Freeport, Ill. With several bad stretches of subgrade requiring over 12,000 cubic yards of subgrade replacement with crushed stone, he was able to maintain 1,200 feet of 22-foot section of 9-7-9-inch pavement requiring 0.5123 cubic yards of concrete per linear foot of slab with two 7-hour shifts daily, using a new 27-E Rex paver.

Form Setting and Fine Grading

The contractor used his own grading outfit for the rough grade well ahead of the paving. This included one RD8 with a 12-yard Carryall scraper and two Sixty tractors with 8-yard Carryalls. Also he ran his own crushing plant for the 12,000 cubic yards of stone required for the subgrade replacement. This material was well rolled ahead of the fine grade crew with a 7-ton Wehr roller.

The trench for the 9-inch Blaw-Knox steel forms was cut with a Ted Carr Formgrader and then the forms were set by a crew of six men under a competent foreman. As soon as the forms had been set and the pins driven, the R-B Finegrader followed closely and cut the grade to the required section. The thickened edge of 9 inches runs for 2 feet from the edge and then is reduced to 7 inches in the next 2 feet. The pavement slab has a parabolic crown of 1½ inches which is duplicated in the subgrade. Where there was any filling needed on the subgrade back of the Finegrader, an Austin 5-ton Pup roller compacted it, leaving a fine smooth clean grade for final checking by two men with a scratch template. At the same location two men from the form crew were employed adjusting the forms and tamping under them where needed for a firm foundation. With the method of running the paver on the shoulder there was none of the usual

replacement of a form which had to be removed so that trucks could get through and turn before backing to the paver on the subgrade.

Around the Paver

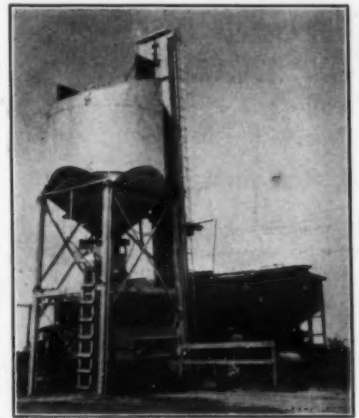
To insure that the trucks had good going along the shoulder, a Caterpillar Thirty and an Adams No. 11 leaning-wheel grader were frequent visitors to the shoulders near the paver, smoothing them for the batch trucks. Both trucks and paver ran on the left shoulder, looking forward in the direction of progress, and the new paver had a 35-foot boom to permit it to reach out over the 22-foot roadway and beyond the section that had been struck off for the reinforcing fabric.

After the batches were dumped into

the paver under the direction of the man at the skip, they were given a 1-minute mix and then delivered to the subgrade. The first concrete was struck off 3 inches below the surface for the laying of the fabric mesh. This was done with a heavy metal strike-off pulled by a cable attached to a Fordson tractor 125 feet ahead on the subgrade.

With the subgrade in perfect condition and not cut up again by batch trucks, the usual men around a trail-grader behind the paver were dispensed with on this job. Three men were busy setting the steel, while one of the crew wet the subgrade and oiled the forms with a pressure sprayer. One man was busy vibrating the concrete at the center steel, on both sides against the forms and around the expansion joints. Two puddlers were used on the strike-off concrete as that was maintained a considerable distance ahead of the finishing machine and there were four in front of the Ord finishing machine.

Water for the paver and the curing crew was supplied by a pair of Rex tri-



C. & E. M. Photo
Bulk cement handling from railroad car to batch truck.

plex pumps with Waukesha motors, one located about 2 miles south and 1 mile east of the relay pump near Eldena. The
(Concluded on page 32)



SOMETHING NEW ON WHEELS

WHAT IS IT? The Moto-Crane is not a truck crane. It's new and different in that it offers a complete, integral unit—of crane and mounting—with a mounting designed exclusively as a Crane Carrier. The Moto-Crane offers you a crane and carrier as one complete package—built by one manufacturer and covered by one standard warranty.

WHAT ARE ITS ADVANTAGES? The Moto-Crane is offered in 5 sizes ranging from light weight to heavy-duty, big-capacity units. All models offer the following advantages—

CRANE CARRIER

1. 3 axle mounting supported on 10 rubber tires.
2. Mounting is built of standard parts available all over the country.
3. Shorter wheelbase for better maneuvering.
4. Special chassis frame design eliminates reinforcing.
5. 10 speeds forward and 2 reverse.
6. Offset cab permits carrying boom in lower traveling position over front end.
7. Rocker arm rear end replaces springs—gives flexibility for road travel—rigidity for operation.
8. Space for groundman, tackle and rigging.

CRANE TURNABLE

1. Simplified Center Drive direct-to-the-point power application.
2. Balanced to provide the greatest capacities per pound of weight.
3. Steel erector's precision boom hoist, with power control of boom lowering.
4. Pin-connected boom with center sections and straight or gooseneck tips.
5. Cab type tagline which functions efficiently at all boom angles.
6. Winch Head and Third Drum attachments.
7. Convertible to Dragline, Clamshell, Shovel, Backdigger.

WHO MAKES IT? The builder of the Moto-Crane has built more truck cranes than all others combined. The Moto-Crane is no "off-the-cuff" development. It's the outgrowth of 22 years' experience in this specialized field. Send for complete details.

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NO JOB TOO SMALL OR SHORT . . . NO JOB TOO BIG OR TOUGH



Raising a giant girder by derricks on the Edison Bridge at Perth Amboy, N.J.

Big Girder Placed On Edison Bridge

One of the largest fabricated steel members ever lifted by derricks on a construction job was recently hoisted into place on the Thomas A. Edison Bridge now under construction across the Raritan River near Perth Amboy, N. J. It is one of two girders, each measuring 260 feet long x 20½ feet deep, and was lifted a distance of 130 feet from the barge deck to the pier tops of the bridge. Each of these girders comprises one complete 200-foot span and 60 feet of an adjacent span which crosses the river's main channel. The overall weight of each girder as it was hoisted into position was 200 tons.

The girders were transported from the Bethlehem Steel works at Pottstown, Pa., to the bridge site by a special train and barges. The girders extended the length of five cars on the train, although their weight rested on only two cars. In order to clear underpasses en route, the lower portion of the 21-foot deep bend over the main pier had to be shipped separately and assembled with the upper portion at the bridge site. Due to the great surface area of these girders, which are the longest and largest ever put into a bridge in the United States, it was necessary to wait for calm weather before lifting operations could be carried out.

The bridge, which is one of the largest deck girder structures in North America, was designed under the direction of Morris Goodkind, Bridge Engineer for the New Jersey State Highway Department. It is being erected by the Construction Division of the Bethlehem Steel Co., and will eliminate the Victory Bridge bottleneck on Route 35 and complete the Perth Amboy-South Amboy bypass. The structure is scheduled for completion early in the summer of 1940 and contains twenty-nine spans varying in length from 84 to 250 feet. The total length of the bridge and approaches is 4,385 feet, and it required 9,500 tons of steel structure.

Power Control Units

Two new three and four-drum power units for operating tractor equipment such as scrapers, bulldozers, and rippers have recently been announced by the Wooldridge Mfg. Co., Sunnyvale,

Calif. These new units have a simplified design with fewer parts, to provide compactness with light weight and greater strength.

The four-drum unit has four independent drums operated with only two levers, providing a trigger-quick positive control of any one of the drums at all times. The three-drum unit has three independent drums operated with two levers. Both units are equipped with Timken and Norma Hoffman bearings and Zerk pressure lubrication. They are mechanical gear driven, with all gears enclosed and running in oil. They have a line speed of 223 fpm on a bare drum and 424 fpm on a full drum. The line pull from a bare drum is 6,500 pounds and from a full drum, 3,400 pounds. Both line speed and pull are based on 100 hp at 850 rpm.

Further information on Wooldridge power control units, as well as on Wooldridge dirt-moving scrapers, bulldozers and rippers, may be secured by interested contractors and engineers direct from the manufacturer.

New Mobile Tunnel Nears Completion

(Continued from page 1)

with a catwalk on either side for police and tunnel employees. The tunnel has one other distinction in that it is of the trench-type; hence sand hogs were not needed in its construction.

The method of construction was substantially as follows: steel tubes some 300 feet long and 34 feet in diameter were fabricated by the Alabama Drydocks & Shipbuilding Co., the end of the sections sealed and the steel hulks floated out into place in the river. They were then sunk in a predetermined place in a previously excavated trench in the river bed. The tunnel sections were then given a cement coat inside and welded together to form one continuous tube.

The depth of the ship canal in the Mobile River, the outlet to Mobile Bay, is 35 feet, and the top of the tunnel sections were placed 45 feet below the

surface, or 10 feet below river bed. This was required so that the river channel may be excavated to a depth of 45 feet if desired in the future. Since the tube sections are 34 feet in diameter, the trench had to be excavated 44 feet in depth below the river bed. Some 1,000,000 yards of excavation was necessary.

At the east entrance of the tunnel, provision was made for massive storm gates which can be closed when Mobile Bay waters engulf Cochrane Causeway, thus threatening to inundate the tunnel. Five minutes will be required to close these gates.

The tunnel is being financed through a \$1,500,000 PWA grant and a \$2,500,000 RFC loan to the City of Mobile, sponsor of the project. The Arundel Corp. of Baltimore is the general contractor, and the dredging contract was sublet to the Murnan Dredging Co. of Mobile.

Something to remember: grease is cheaper than repairs.

Owners report that LIMA shovels are hitting new high marks for big yardage at low cost along the 161 mile Pennsylvania Turnpike. At times the digging consists of rock that ordinarily would have to be shot-up before a shovel could handle it, but LIMA'S are taking it without coaxing. Maximum power backed by sturdy construction and dependable service are qualities you get in every LIMA regardless of size. Hook up with a LIMA, the excavator that does things in a big way.

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Types of Road Work In Walworth County

(Continued from page 7)

charge of the garage and the men look after their own equipment, with the exception of a few operations, such as welding, for which some of the men are particularly adapted and therefore do that type of work on all equipment. There are 38 regular yearly employees and 7 extra in the summer of 1939.

All equipment is returned to the garage every night, except rollers and other particularly heavy machines, and the snow equipment when working in emergencies. The tractors and rollers are greased out on the road but everything else is handled in the garage by the shift drivers.

The county road equipment, other than that which is listed under snow removal below, comprises: twenty-three Ford trucks, all of which are dump units except three; one 1½-ton FWD dump truck; four pick-up Ford trucks; six power graders, three 12-foot and three 10-foot blades, three of which are Caterpillar, one Adams, one Allis-Chalmers, and one Austin-Western. There is one air compressor; one Koehring 2-bag mixer; two 12-foot pull-type Austin-Western graders; two road rollers, one 10-ton Good Roads and one 5-ton Wehr; five assorted tar kettles from 3 to 5-barrels capacity; and some minor hand tools. All shovel work and stone crushing is let by contract.

Types of County Roads

The types of roads in order of their predominance in the county system are: oil-mat, retread, concrete, and gravel. In the state system in Walworth County they are: concrete, retread and oil-mat, the two latter having only 4½ miles each. It is also of interest to note that there are only 5 miles of gravel roads.

The oil-mat roads cost only \$1,500 per mile, exclusive of any grading. When a road is to have this treatment, the gravel on the surface is made up to 300 cubic yards per mile of 20-foot road which is about 3 inches loose and gives a 2¼-inch surface course when completed. Pit-run gravel is used almost exclusively, with 50 per cent passing a ¼-inch screen and 1-inch maximum stone. With the gravel spread to the width required, an 85 per cent asphaltic road oil is applied by contract at 15 to 17 gallons per cubic yard of gravel in three applications and thoroughly mixed after each application with an Adams Retread Paver pulled by two Allis-Chalmers Model L tractors. When the weather is cold the applications are made in four shots.

At the end of a day's work, the material is windrowed if there is any sign of rain; otherwise it is left flat and traffic allowed to use the road. When the mixing is complete the material is spread to the 20-foot width with a blade and then rolled with the 5-ton roller to key the stone and prevent whipping out by traffic.

Retread paving costs the county about \$3,000 a mile of 20-foot road and is used on the more heavily traveled roads on top of old oil mat or tar mat. The aggregate used is crushed or screened gravel from ¼ to 1½-inch stone. It is handled like the oil mat except that the material is windrowed to the side until it is time to apply the binder. About 1,050 cubic yards of the stone is used per mile of 20-foot road and tar is used as the binder, with from 11 to 13 gallons per cubic yard of aggregate in three or four applications. The mixing is done with the retread paver and then at the end it is spread, and rolled with a 10-ton roller.

Snow Removal

Each patrol man has a small blade plow for mounting on the front of his truck for light snows. In the last two winters there was no snow and in the previous winter 86 inches. The other heavier snow-removal equipment, including the heavy trucks not listed under "Equipment," comprises: two 3½-ton

FWD trucks with Wausau V plows; one 5-ton FWD; one 5-ton Oshkosh; two 7-ton trucks, Oshkosh and FWD; one 5-ton Super truck; all equipped with Wausau V-type plows. In addition the county rents as required two 5-ton International trucks with V plows and two 3½-ton FWD trucks with V plows. The heaviest equipment used by the county in this work is its two Model L and one Model LO Allis-Chalmers tractors with

Wausau V plows.

In handling a snow storm, the patrolmen start out with the storm and then, as the intensity of the fall increases and they are not able to keep the roads clear, the heavier equipment is sent out.

Personnel

H. J. Peters is County Highway Commissioner of Walworth County with I. S. Grasel as Patrol Superintendent.

MARCHING FEET that DELIVER SUPER RESULTS

DAVENPORT SHEEPSFOOT ROLLER

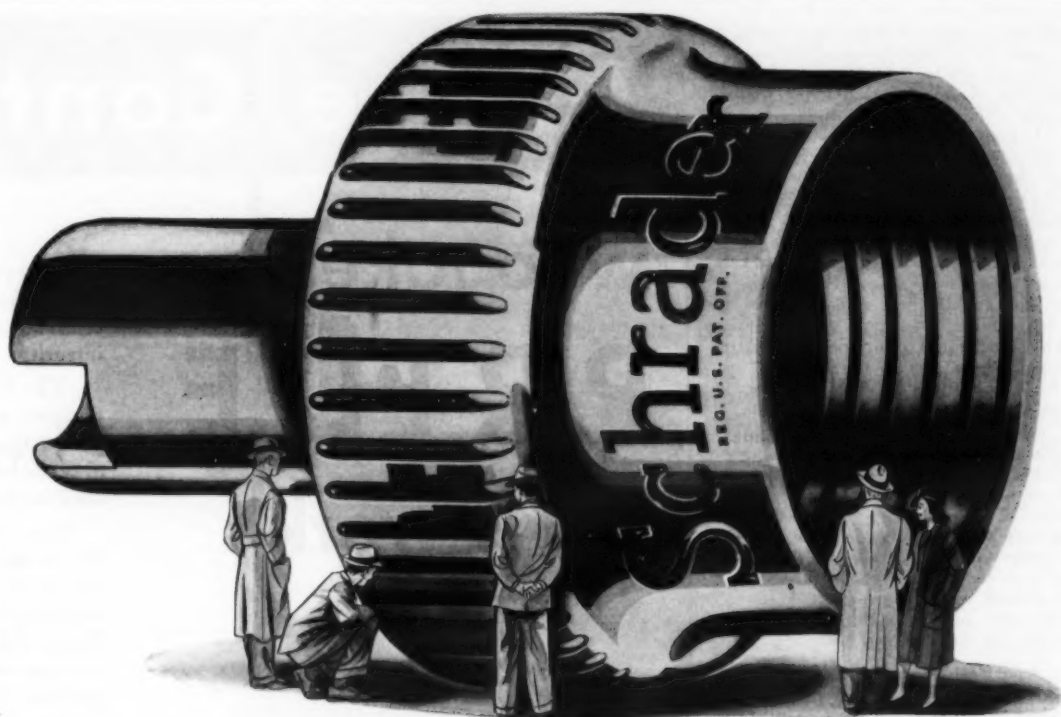


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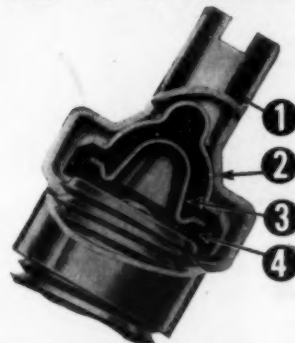
IF A VALVE CAP WERE BIG AS A HOUSE . . .

you could make a tour of inspection through this giant cap and see the many unique construction features. But size could add nothing to its importance as a tire valve seal.

No valve mechanism has ever been designed that can not eventually become damaged by foreign matter from within or without . . . and it's hard to find a dirtier place than the rim of the wheel.

A closure is therefore essential to keep harmful dirt and muck out of the valve. When a tire valve is sealed with a Schrader Valve Cap, no air can escape through it even if the valve mechanism washers had been entirely removed.

The service records of efficiently managed truck, bus and passenger car fleets show that air-tight valve caps are necessary for better operating safety and longer tire mileage.



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Unusual Bridge Structure On Queen Elizabeth Way

(Continued from page 9)

sheeting run horizontally and with 2 x 6 inch and 2 x 8-inch studs. The forms were tied with Universal and Muntz form ties. The latter used 3/16-inch high tensile steel tie rods inserted in a "loom" of woven cotton through which the rod slips easily when it is removed from the concrete. The Universal ties were used with 1/2-inch tie rods which were broken off in the concrete. The pours were from 5 to 8 feet high, using pumped concrete entering at the top. The forms were not lined.

The Arch Ribs and Centering

The arch ribs were built with a radius of 98 feet 6 inches on the intrados and 107 feet 10 5/8 inches on the extrados. For centering, the contractor drove timber piles 55 feet long, using about 50 piles for each arch. They were driven progressively across the span from the tops, using a traveler carrying a steam pile hammer at floor level. The piles were driven six to a bent with one on either side of the arch beams and four between. The four center piles carried 12 x 12-inch caps for the wood decking on which the traveler was run. The pile bents were braced thoroughly with 2 x 8's and four lines of 4 x 8-inch longitudinal and transverse horizontal ties. To carry the forms for the arch beams, 9-inch channels were bolted back to back across the two outer piles. Then 9-inch Jones & Laughlin Junior beams were run longitudinally from the blocks carried by the channels to support the 4 x 6-inch plank templates for the forms.

The beam forms were of 2-inch sheeting on the bottom, running transversely and with 2 x 4-inch studs on 2-foot centers. On the sides 1 1/4-inch sheeting was used with 3 x 4-inch wales. These arch ribs were poured by buggy and elephant-trunk chutes in three sections at the two sides and center at the same time to prevent distortion. Then the two short key sections at the third points were poured within the next 48 hours, but never before 24 hours had passed after pouring the other sections.

Spandrels and Pier Legs

The arch ribs supported ten spandrels of which the two center ones were close-

ly connected with the deck and hence not true spandrels. The eight remaining spandrels were poured at one time and the adjacent pier legs were brought up at the same time. The pier legs are only 1 foot 6 inches thick with 12 inches between them at the main piers. These long thin sections, 14 feet from the top of the pier to the deck, have a 6-foot transverse arch tie beam between each pair of legs with a 2-inch expansion joint at the top. This was poured with asphalt before the structure was completed and opened to traffic.

The handling of the forms for the inside of the pier legs with only 12 inches clear between them was an interesting problem for the contractor. It was solved by using the Muntz form ties with a concrete spacer between the two forms and through which the tie rod

passed from outside to outside of pier-leg forms. The concrete block was 4 x 4 inches in cross section and with a 1/2-inch hole through the long dimension. It rested against flat steel washers placed between it and the 1 1/8-inch straps or studs running vertically to hold the 1 1/8-inch sheeting in place.

The Deck and Sidewalk

The deck and curb were poured integral and then the sidewalk was poured later with the gutter. The paving over the structure is a 2-course trap-rock hot-mix pavement with a light coat of Amiesite brushed on as a seal. The deck is 9.5 inches uniform thickness and the sidewalk 5 inches thick. The standard panel forms were used for the pouring of the deck and sidewalk with the outside forms hung over the side on cantilevers.

The pouring of the hand-rail posts was novel, in an endeavor to get away from the usual break in the continuity of the concrete where posts are poured after the curb and on top of it. As the posts on this bridge were carried down the



An unusual view of one of the Wenley twin bridges in Ontario.

side of the curb for ornamental purposes, the older method of pouring

(Continued on next page)

To the Contractor

who takes
PRIDE
in his work



YOU can either do the job to "get by," or build a road to last, to be of real service, to stand as a testimonial to your skill, and integrity.

The Barber-Greene Tamping-Levelling Finisher, not only lays a level surface, it compresses the material to a uniform density, even over the low spots. The compaction is done by the Finisher, not by damaging traffic.

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Concrete Placing For Henley Bridge

(Continued from preceding page)

would have made the crack between the post and the curb much longer than usual. To obviate this and to improve the appearance, the contractor left a notch the size of the post in the outside of the curbing with the steel for the post left exposed. Then separate forms were placed and the curb poured as a monolith from bottom to top with the result shown in the illustration on page 44.

Pulling the Centering Piles

As the centering had to be left in place until the adjacent arch beams and deck had been poured, the result was that the centering remained until pretty much of the structure was completed and cured. In order to be able to pull the piles, the contractor was permitted to leave eight 10 x 10-inch holes in the deck for each span with the reinforcing carefully bent back. Through these holes the pile centering was pulled in a novel and effective manner. The holes were tapered from top to bottom so that the wire cable used for the pulling could go straight out to the piles being pulled without touching the concrete. This was the only part of the pulling that was not successful, as the cables frequently did touch the concrete and the tapers were quite effectively removed by the rubbing of the cables in several instances. This resulted in no permanent damage to the deck as it was repaired when the holes were cast later.

The pile-pulling rig consisted of a winch with a 15 to 1 ratio driven through a pulley by a belt from a small tractor. A 1/2-inch steel cable was used. The cable was threaded through a pair of multiple blocks below the deck and then a sling fastened around the top of the pile to be pulled. The total ratio of effective pulling power from the tractor to the sling was about 60 to 1. The piles came out smoothly but the strength of the pile tops sometimes was not sufficient to withstand the tight sling and they were cut off by it. It was then a case of "try, try again" until the pile came out in one piece.

Concrete Plant and Placing

For pouring the piers, all of the con-

crete was placed with the Rex Pumpcrete plant. This was a single-pump unit with a 7-inch pipe as described before. The batching plant for the machine batched by weight and delivered to a Smith 28-S mixer. The materials were handled to the bins by an Erie steam crane. Above the piers all of the concrete was run out onto the deck and poured from the trestle which had been used by the traveler, using hand-pushed buggies delivering to elephant-trunk chutes. The maximum distance the concrete was pumped was 700 feet and the maximum distance it was buggied by hand was 500 feet.

All of the concrete was vibrated, using several types of gasoline-engine portable vibrator outfits that could be moved easily from place to place. The specifications required the use of Pozzolith in all of the concrete above the piers, at the rate of 2 pounds per bag of cement. The concrete used was Class C for foundations, a 1: 2 3/4: 3 3/4 mix; and Class B for everything else, a 1: 1 3/4: 3 1/2 mix. The aggregates consisted of limestone and sand.

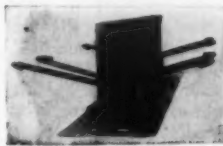
Winter Concreting

For concrete work during the winter the aggregates and the water for the mix were always heated. Pouring was done only in mild weather when the temperature was 35 to 40 or higher. The engineers kept in touch with the local meteorological bureau to determine the probable turn of the weather during the time of a pour and the succeeding hours

of curing. The concrete leaving the Pumpcrete unit in November and December was about 70 degrees while at the discharge end it was 50 degrees.

To protect the concrete during setting and curing when the weather was below freezing, the section poured was completely housed, using a wood frame and Sisalkraft paper and tarpaulin spaced about 18 inches from the concrete. Steam

(Concluded on page 34)



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CONTRACTION JOINT

Translode Angle-Unit With Continuous Base

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The Translode Angle-Unit is the answer to the engineer's and contractor's problem because:

It is a complete joint ready to be placed on the sub-grade.

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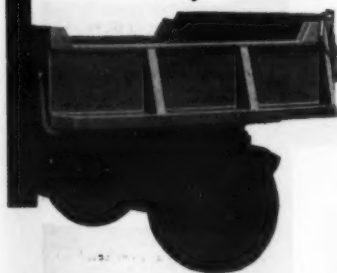
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Manufacturers, Material Handling and Maintenance equipment

Reducing the Costs Of Moving Road Dirt

Selection of Equipment, Overall Operating Costs, And Capacities Must Be Studied by Contractors

By J. L. HARRISON, Senior Highway
Engineer, Public Roads Administration

Part II

† IN proceeding with the execution of a dirt-moving job, the contractor's first consideration should be the type of outfit best suited to handle the work. This may seem a bit theoretical for if the contractor happens to have only one outfit, he has no choice in this matter. Perhaps it would be better to say that he exercised his choice when he entered a bid on this project in preference to others on which he might have bid. If he has a considerable variety of equipment and can outfit the job in several different ways, the selection of the type of outfit he will use becomes a matter of considerable importance, for while earth work is regularly handled by several widely different types of equipment, the conditions under which the work is to be performed greatly affects the efficiency with which the different types of equipment can handle it.

Draglines are quite efficient when the work is that of constructing embankments out of side borrow which lies close to these embankments. On the other hand, draglines are almost never used in removing materials from cuts and loading it into wagons. Power shovels are the most efficient tool for handling broken rock, but neither the shovel-wagon nor shovel-truck outfit can compete with the modern elevating grader outfit or with modern large scrapers in handling well-lying ordinary common excavation within the haul distances ordinarily encountered in highway construction. Again, comparing elevating grader outfits and modern tractor-drawn scrapers, both working in good common excavation, the latter type of equipment has the advantage wherever hauls of moderate length are involved.

Digging—Moving—Placing

All of these facts are related to the more general fact that as handling earth work involves three separate and distinct operations,—first, digging the material; second, moving it to the place where it is to be used; and third, placing it in its new location—the most efficient equipment set-up is the one in which these successive operations are handled with the greatest average efficiency.

Dragline

Let us suppose that a dragline, as installed, is worth \$25,000 and is handling a bucket that will deliver 2 cubic yards per load. It is apparent that if the material is being moved to final position by this machine, we are using a \$25,000 unit to dig, to haul and to place. It is equally apparent that when the distance the material must be moved is so short that it takes very little longer to swing the load into position than it would take to swing it over a wagon or a truck and drop it there, dragline operation will be efficient. But as the distance the material is moved increases, the desirability of handling it in this way decreases, for more and more of the dragline's time is then spent in moving the material—hauling it, if you please—and when it is used in such hauling work the result is the use of a \$25,000 outfit for hauling, when a \$1,000 truck, or a couple of them, could do the work better. Therefore, the limit of economical

usefulness of this type of equipment is reached when the distance the material must be moved is such that it can be hauled and deposited more economically by some other means.

Tractor-Drawn Scraper

If the operation of a tractor-drawn scraper is examined critically, it will be observed that it is not particularly efficient on very short hauls. The reason is that, while it hauls efficiently and economically and digs well in good ground, enough time is lost in digging, in turning, and in depositing each load, so that its relative efficiency on very short haul work is measurably reduced. However, in the highway field there is so little very short haul work that ordinarily this characteristic of this particular type of equipment is without practical significance.

Overall Operating Cost

The type of outfit selected to handle an earth-work contract should be the one which can be expected to place the

largest yardage of material per dollar of overall operating cost. Overall operating cost, as here used, includes the labor cost which the operations of digging, hauling and placing will involve and the direct operating expense; that is, the cost of fuel, oil, repairs, etc., and the cost of wear and tear on the equipment. When job tooling is examined in the light of probable overall cost of operation and of probable output, it usually will be quite clear that some one type of equipment is *theoretically* the best.

I say theoretically advisedly, for practical considerations may, and often do, require the readjustment of conclusions which are theoretically correct. In the efficient handling of earth work, prospective rainfall during the construction period, and its probable effect on the stability of the ground over which the hauling must be done, is a practical consideration which may easily have more influence on the type of equipment to use than overall operating cost. Or, perhaps it would be more accurate to say that after examining overall operat-

ing cost, on the assumption that operating conditions will be good, it should be re-examined in the light of uncontrollable factors that may affect it. Thus, haul distance being rather long, one would normally use trucks in hauling from elevating graders or power shovels, but if a good deal of wet weather is likely and a good deal of poor subgrade may be expected, tractor-drawn wagons should be considered. Job tooling must be carefully studied and thoughtfully worked out because the tooling imposes fixed limits on the manner in which the work will be handled and the cost at which it will be performed.

Outfit Types

Outfits used in grading fall into two classes: those in which digging is done by one unit, hauling by an entirely different type of unit, and depositing generally by a third type; and those in which all of the work of digging, hauling and depositing is handled by a single

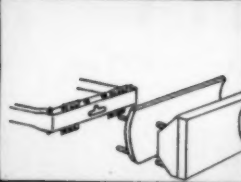
(Continued on page 42)



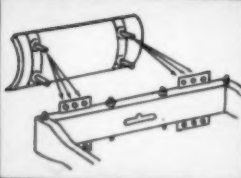
Blade Rolls
the Dirt



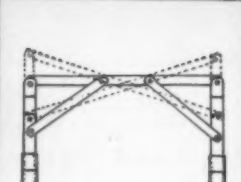
Interchangeable
Blades



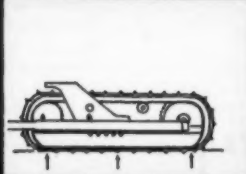
Blade Adjustable
Horizontally



Adjustable to
Any Angle



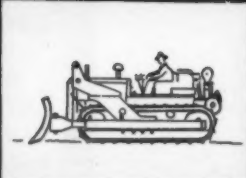
Utilizes Full
Tractor Power



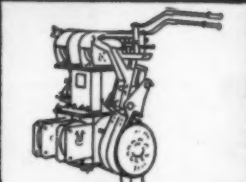
Full
Floating Blade



No Overhead
Frames



Full
Cable Control



Worn Dipper Teeth Renewed by Welding

Worn-out parts that were once bound back on the job again, due to modern arc welding. In the case of worn-out dipper teeth, for example, hard-surfacing by welding with a manganese base electrode gives them new life, resulting in big savings. Strongly resistant to wear and abrasion, these renewed dipper teeth often last five to six times as long as the usual steel dipper teeth.

Here's the procedure, as recommended by the Harnischfeger Corp. Anneal the tooth points to remove hardness where the welding is to be done. The top face is then overlaid 2 inches and the under face overlaid 3 inches to avoid ending both welds in the same place and to guard against breakage at the edge of the weld. The side points are overlaid 2½ inches back from the point of the tooth.

Complete information on this process of renewing dipper teeth and on Smooth-

arc Harcote, an electrode of the self-hardening type designed for this type of work, may be secured by interested contractors and state and county highway engineers direct from the Harnischfeger Corp., Welding Division, 4419 W. National Ave., Milwaukee, Wis.

New Hydraulic Scraper

The new Bucyrus-Erie H-28 2-wheel hydraulic scraper, recently announced by the Bucyrus-Erie Co., South Milwaukee, Wis., is built for use with tractors rated at 25 to 35 hp. It has a struck capacity of 2½ cubic yards but will, according to the manufacturer, heap to loads of 3 or 4 cubic yards. Since the H-28 with its tractor can be loaded on a regular truck and hauled within the usual dimension and load limits, it is especially adaptable for work involving fast moves from job to job. The H-28 can also be used with a rubber-tired tractor, making a complete dirt-moving and traveling layout and high-speed all-on-rubber hook-up which will not dam-

age hard-surfaced roads.

Similar in design and construction to the larger B-E 2-wheel scrapers, the H-28 operates on a safe low-pressure hydraulic system. It has the B-E double-curve cutting edge, and dumps backward and behind the wheels like a dump truck, so that the unit may dump its load over the edge of a bank or fill, or from a ramp into trucks. When dumping on the level, the loads may be spilled in a heap and the adjustable floating tail-gate floats over the dumped load. If desired, the load can be dumped in a windrow and then spread.

Like all B-E scrapers, the H-28 can be hauled by a tractor equipped with a Bucyrus-Erie Bullgrader or bulldozer. Hydraulic pressure for both units is furnished by a single pump on the tractor, and each unit is controlled by a separate valve conveniently located beside the operator.

Complete information on this new H-28 scraper may be secured direct from the manufacturer or from this magazine.

Contract Seeding On Ohio Roadside

Work of Seeding Speeded By Machine on Typical Roadside Improvement Job in Fayette County

(Photos on page 4)

† A TYPICAL Ohio roadside-improvement project was completed last year on State Route 35 in Fayette County by the W. A. Natorp Co., Cincinnati, Ohio. The road construction was done in 1938, and in the spring of 1939 a separate contract was let for seeding about 6 miles of roadside, with a limited amount of sodding and planting of a small quantity of Halls' honeysuckle and forsythia on some of the steeper fills and backslopes. The contract required completion in November, 1939.

In this section the land is rather flat with occasional rolling contours. On this job, where steep backslopes occurred, they were usually the result of the deep ditch excavation required to take care of surface drainage. These backslopes varied from 4 to 10 feet in width and the fill sections averaged slightly more.

Seeding specifications required the loosening of the surface to a minimum depth of 2 inches and hand-raking to remove all stones and other debris to prepare a proper seed bed. Since the site of the work lay in a rich agricultural section, considerable topsoil had been obtained from the excavation during the construction contract. No attempt was made to segregate this top soil and it was used indiscriminately in all required filling. As a result, the major portion of the job consisted of a medium high-grade mixture of clay and a rich clay loam, with some chocolate loam.

Work of Seeding

When the areas had been properly loosened and hand-raked, commercial fertilizer, 4-12-4, was applied at the rate of 10 pounds per 1,000 square feet. An innovation on this job was the contractor's use of a seed drill, similar to those used in golf-course seeding, to handle this phase of the work.

After the seed drill had been carefully checked for proper distribution of seed, 3 pounds per 1,000 square feet, the actual seeding operation started. Using a Toro tractor to pull the drill, and with one man in constant attendance to prevent choking of the drill and to check the hopper, seeding proceeded rapidly and required only two men for that operation.

One trip each way was made over each drill width, thus "doubling" to insure full coverage. All backslopes and other irregularities, inaccessible to the drill, were sown and raked by hand. The disks cut a groove which usually averaged about ¾ inch in depth, thus insuring fairly deep seeding and proper coverage. The required rolling followed immediately as a separate operation.

Seeding was carried out over consecutive sections as rapidly as the hand work was completed. The actual seeding operation itself was done in considerably less than the month utilized for the entire contract, and good germination was in evidence over the first section before the final section was completed. Immediately following the completion of the contract, about June 6, there was a month of rainy and comparatively cool weather and the resulting germination was excellent over the entire project.

Contractor Makes Contribution

Under average conditions, the November completion date specified in the contract was met.

(Concluded on page 28)

BUCKEYE builds the tractor equipment that digs its own way in and keeps the pay dirt rolling ahead for you. Rock, dirt, trees, underbrush, mud — up, down — over and around — it's all in the day's work for these huskies. Powerful sidearms and front cross beam push brute blades that roll the load ahead with the least power — cable control gives lightning lift and power to spare — no extra equipment needed to create down pressure — extreme simplicity — single or double

drum power control units with adaptors for different tractors — quickly attached.

When you want to move earth and move it in a hurry, you need Buckeye Bulldozers, Trailbuilders, Rippers and Power Control Units. And when each day's work is done, you'll see real progress, see why it pays to have Buckeye on the job. See now about putting this line of profit-makers to work for you.

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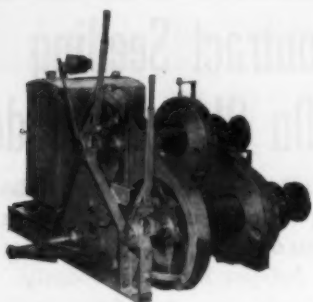


Surface Graders



Spreaders

Buckeye



The new Model 20 American hoist.

New Utility Hoist For Smaller Jobs

The new Model 20 American general-purpose hoist, recently announced by the American Hoist & Derrick Co., St. Paul, Minn., is a simple rugged single or double-drum unit, with gasoline or electric power.

Among the features of the Model 20 are the frictions and brakes placed at opposite ends of the drum to promote cool running; the shrouded ratchet ring with chisel-type dog, on which all stresses are in compression; a drive shaft which turns in anti-friction bearings, and is placed between the drum gears as on the larger hoists; and frictions of the improved band type, easy to engage.

The drum on this hoist is 8 inches in diameter x 15 inches long, between 15-inch diameter flanges. Its line pull is 2,000 pounds, based on a second wrap of $\frac{3}{8}$ -inch rope.

Further details on the Model 20 American general-purpose hoist are contained in Bulletin No. 100-H-O, copies of which may be secured direct from the manufacturer or from this magazine.

Hydraulic Trailbuilders

Features of Heil hydraulic trailbuilders made by The Heil Co., Milwaukee, Wis., include hydraulic equalization which compensates for uneven traction; hydraulic power; a two-stage pressure relief valve; the oil storage tank mounted in the fender; replaceable alloy side castings; all thrusts transmitted directly to the frame; reversible, three-piece hard-faced cutting edges; replaceable and adjustable shoes; and a blade which can be angled

to either side easily and quickly.

The Heil trailbuilder for use with the Cletrac Model D has a standard blade length of 9 feet 2 inches, a cutting width, in angling position, of 8 feet 2 inches, a 35-inch blade lift and 20-inch blade drop, and a reversible cutting edge $\frac{5}{8}$ x 6 inches.

Bulletin RM425, containing further details on Heil hydraulic trailbuilders, may be secured by interested contractors and state and county highway engineers direct from the manufacturer or from this magazine.

Tank-Car Heaters

The Bros circulating tank-car heater, made by the Wm. Bros Boiler & Machinery Co., Road Machinery Division, Minneapolis, Minn., is mounted on a semi-trailer chassis or four-wheel trailer, or can be mounted on a truck chassis. On the frame is a road-oil heating tank with coils so arranged that the oil flows in at the cool end of the coils and emerges at the hottest point, near the

adjustable air atomizing oil burner.

At one side of the tank is a heavy-duty water-cooled motor with integral change-speed transmission connected by a chain drive to a high-efficiency road-oil circulating pump. The heater is made in two sizes, and with it oil may be

heated to any desired temperature.

This Bros tank car heater is described and illustrated in a folder on Bros road equipment, copies of which may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

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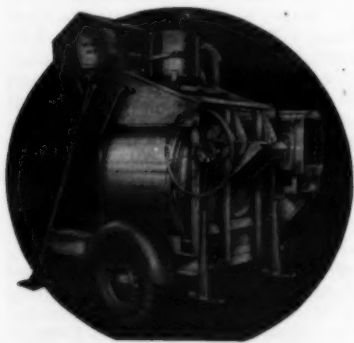
They demand truck qualities—smooth, dependable power from a heavy-duty truck engine . . . strength to stand continuous operation at full capacity . . . fuel and oil economy that lasts the life of the truck.

Chevrolet trucks give these two things in full measure—every desirable truck quality is built into them and safeguarded for the life of the truck by highest-quality materials. For Chevrolet trucks are all-truck—in design, and in every unit . . . from special truck engines through every unit of the chassis.

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Counties Improve Needed Highways

Missouri Counties Find Funds Can Be Stretched For Minimum Equipment To Provide Good Roads

(Photo on page 44)

AS never before, counties are beginning to realize that good roads are their greatest asset. Farm-to-market roads are vital to a county's progress and equally important are the roads necessary for school buses and the rural mail.

St. Clair County, Missouri, with the county seat at Osceola, was typical of all too many counties. It had only enough funds to build the essential roads and to repair only the roads that had become impassable. Occasionally the most widely used roads were dragged by farmers.

Little or no maintenance had been done; consequently the roadsides had become overgrown with underbrush, the ditches were full, and rains made a majority of the roads impassable.

In the spring of 1939, this county decided that it was folly to leave the roads in such a condition, so the County Court, which is responsible for the roads, decided to use its funds to begin a constructive road program. As the county did not own any equipment and the funds available were none too large, the initial equipment investment had to be made in equipment that could perform a variety of work. An analysis of their needs showed that tractor-drawn graders best suited their requirements, so two Allis-Chalmers Model S tractors and Model 110 leaning-frame graders were purchased.

These two units were immediately put to work widening roads and pulling ditches, which were the most urgent needs. Erosion had taken its toll on the sides of cuts and fills, but graders now have this problem in hand. As soon as existing roads have been put back in shape, new roads will be constructed and maintained with the grader units.

A factor influencing St. Clair County in favor of tractor-drawn graders was the fact that the tractors would be available to use with scrapers, tampers, and

rollers, thus enabling the county not only to build roads through rolling country, where cuts and fills are necessary, but also to cut down grades on existing roads, reducing washing and erosion.

This county is divided into fifteen common road districts supervised by the County Court and eighteen special road districts, each under its road commission. The graders are owned by the County Court which uses them on their roads and rents them to the eighteen road commissions. This system seems to work out very well, and the farmers are satisfied because their roads are fast becoming all-weather highways. L. W. Garrison is Presiding Judge in St. Clair County.

Cole County's Problem

Cole County, Missouri, has a more difficult problem than St. Clair County because of its hilly terrain and numerous streams which must be crossed. F. E. Ross, County Engineer in charge of all construction and maintenance, states that

roads are being built in Cole County, including drainage and grading, with county labor and machinery at an average cost of \$1,000 per mile.

Cole County has a well-balanced and practical fleet of equipment. For constructing new roads, widening present roads, and pulling ditches, an Allis-Chalmers Model L tractor and Model 110 grader are used. Two A-C Speed Patrols with a two-man crew are used to maintain over 400 miles of road.

Probably the most useful tool is the Allis-Chalmers S tractor and Continental 2-wheel scraper because of their ability to backfill around culverts, bridges, and to fill in washouts. By cutting down knobs in the hilly sections, the scraper reduces grades and decreases washing and erosion.

Farmers in Cole County are proud of their roads which are being constructed and maintained at a nominal cost.

Good Roads for All

Every county would like to have good roads the year around, and every county



This A-C Model S tractor and Continental scraper are a part of the road-building and maintenance fleet owned by Cole County, Missouri.

road official is eager to provide such roads. Unfortunately lack of sufficient funds has deprived many rural residents of the good farm-to-market road system to which they are entitled.

Good roads today are *not* expensive, for with modern machinery and methods and intelligent administration of road funds, a good serviceable county road system can be built economically.

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is toughest . . .
put a
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TYPE UPW-35
ROCK MASTER
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NOTE how simple it is to set up for the most difficult holes. The U-arm can be rotated 360° by an easy to operate, totally enclosed worm and gear mechanism. The drifter and feed are mounted on the arm by a cone clamp which allows movement in any direction. Whether down holes, breast holes, snake holes . . . or all of them . . . the set up takes only a minute.

Note how the Worthington WD-35 Pneumatic Feed Drifter with centralized control and independent rotation further simplifies the job. Even when drilling overburden, shattered or seamy rock, there are never any stuck steels. The piston is a one purpose part with rotation supplied by the separate powerful motor.

You will find that this machine will use less air and put down more holes all day, every day, and with costs so low they will surprise you.

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To give this service the pump is located so it can be easily packed; working parts are "get-at-able" for proper lubrication; fuel tank is located well away from burners; and correct weight balance reduces wear on tires. Write for Bulletin A-1940—Kinney Manufacturing Co., 3531 Washington Street, Boston, Mass.

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Sewer Job Included Open Cut and Tunnel

(Continued from page 2)

shaft on the north side of Chelsea Creek, and a 100-foot open-cut connection to the present sewer on the south side of the north shaft. The contract was awarded to the C. & R. Construction Co. of Boston, Mass., which also holds the contract for another tunnel section. The ground in this section is particularly difficult, as it is composed of very fine water-bearing sand and organic material, closely adjacent to tidal water. There is also a 70-foot open cut on the south side of the creek for an overflow and a 35-foot open cut to make a connection from the new siphon to the pumping station.

Interference from Old Sewer

On the south side of the creek, that is on the side adjacent to the East Boston Pumping Station, there is an overflow sewer connected to the East Boston line discharging into the creek. The first job on the south side was to bypass this sewer, because the shaft for the new siphon was directly over the center line of the overflow sewer. This bypass was not temporary construction, but will remain in service after the new siphon and the entire North Metropolitan Sewer are completed.

Open Cut on North Side

The first operation on Section 101 was the excavation of a 40-foot pump well 10 feet square formed by driving steel sheet piling. This pump well was driven to unwater the area so that the open-cut section could be handled in the dry and was located adjacent to the north shaft. When excavation had reached a depth of 15 feet, the sheeting toward the bottom buckled, requiring strengthening with heavy knee bracing. When excavation reached 28 feet, there was a blow-in and large quantities of marsh gas and hydrogen sulphide were released in the pit. A 4-inch centrifugal pump driven by an electric motor was installed at a depth of 25 feet in the pit to keep down the water.

One morning after the operation seemed to be well stabilized, the center of the pump pit blew in to a depth of 40 feet down to gravel. This was the elevation at which it had been expected to excavate the pump pit. When the pump in the well was shut off, the water rose to within 20 feet of ground elevation, but by continuous pumping it was kept at a lower level.

When work started on the shaft and excavation reached a lower elevation than the maximum height of the water in the pump well, most of the water flowed to the shaft, reducing the load on the sump pump.

In the 190 feet of open-cut excavation on the north side of the shaft on the north side of Chelsea Creek, the 45-foot steel sheet piling was driven in a previously excavated 8-foot trench, in which the guides were set. The trench was 35 feet deep. A 4½-ton Vulcan Super steam hammer was used for driving the piling, and excavation was handled by clamshell buckets operated by Thew and Koehring cranes, with 45 and 40-foot booms respectively. The Thew crane was equipped with a 25-foot addition for setting the 55-foot sheeting for the shaft.

Very heavy bracing was required for the steel sheet piling throughout the length of the open cut. The 10 x 10-inch timber top ranger and braces were a part of the original guides for driving the sheet piling. The top structural steel ranger below the 10 x 10 timber was 9 feet below ground elevation and consisted of a 12-inch H-beam with an 8-inch flange and weighed 40 pounds per foot. The same size of H-beam was

used for the braces with alternate ones carrying heavy-plate knee braces made of sections of 65-pound 20-inch I beams and two 4-inch angles ¾-inch thick top and bottom. These were spaced 10 feet apart with alternate braces having no knee braces.

The next lower ranger and brace were the same as the top, with hangers composed of 8-inch I beams with 4-inch flanges between the rangers. The next lower rangers were 53-pound beams, the next 65 pounds, and the bottom rangers 99-pound beams. All braces were 40-pound 8-inch I-beams. The maximum depth of the open cut was 35 feet. The spacing of the rangers and braces vertically below the 10 x 10-inch timber rangers was 5, 5¼, 4¼ and 5 feet, respectively.

A portable Westinghouse welder was used to make the welded knee braces in the shaft, to cut the braces and rangers for the open cut, and to make the connections for the steel pipe used for the discharge of the various pumps.

Starting the North Shaft

The shaft on the north side of Chelsea Creek is 23 feet in diameter and was started with 55-foot steel sheet piling. At a depth of 35 feet, steel rings or liner plates were placed and a concrete collar poured in the dry, using ready-mixed concrete. Then after three rings were placed and concreted, the excavation was continued for one ring at a time. The material was hand-excavated from the edge and cast to the center, where it was removed by a ¾-yard Owen bucket handled by the Koehring 576 crane.

When a depth of 50 feet was reached, a boil appeared in the bottom which caused flooding of the shaft. A well was then excavated with a 4-foot diameter steel caisson to 2 feet below the maximum depth of the shaft, 82 feet below the surface of the ground, by means of a bailer and an orange-peel bucket. A 3-stage pump capable of 1,000 gallons a minute at 80 feet was installed, but this was unsuccessful as only 150 gallons of water per minute was pumped. It was then decided to excavate the shaft under compressed air.

A steel deck was used to cap the shaft 30 feet from the surface of the original ground. This deck, ¾ inch thick and heavily braced with H-beams, was designed for 30 pounds air pressure with the aid of a counter load of 540 tons of earth, 16 feet deep. Previous to the

placing of the deck, concrete was poured outside the 23-foot diameter shaft, with the shaft liner plates as inside forms, up to the elevation at which the deck was to be placed. The portion of the deck outside of the circular shaft was then placed and the circular portion of the deck bolted to this outside portion.

The steel deck was heavily braced with H-beams to the steel sheeting. A 3-foot diameter man shaft and lock and a 4-foot diameter muck shaft and lock were bolted to the deck. The water in the shaft was forced out with 15 pounds of air and the excavation started.

(Concluded on next page)

Smooth Operation No Grabbing No Chatter



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Whatever your brake or clutch
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the GATKE Asbestos Friction
Product that will do your job
RIGHT.

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Hercules 60 H.P. Engine Speeds from 1 to
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Automatic Throwout. Beautiful Streamlines.

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machinery specialists who understand what
is wanted and what is needed. It is not
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Buy your Highway Mowers from specialists
and you will get one that will really do the
job and no fooling.

Bad Ground Delays Work on Sewer Shaft

(Continued from preceding page)

This pressure was increased as the excavation was being made, and bottom was reached under 26 pounds of air. This was 80 feet below the surface of the ground. A heavily reinforced concrete mat 3 feet thick was placed and two 14-foot diameter bleeder pipes were left in a vertical position in the concrete mat in order to relieve pressure if desired.

During the excavation under air a 15-foot depth of clay was encountered, then 2 feet of compact fine sand, and coarse sand, gravel and boulders were found at the bottom. Eight muckers in each shift hand-excavated the shaft. Spoil was placed in a 1/2-yard bucket which was hoisted through the muck lock by a crane. A whistle signal system from the shaft was used for crane operations.

A radio system from the shaft to the compressor plant, outside of the man lock, and to the field office was used for communications. Operations were carried on 24 hours a day, seven days a week, in excavating the shaft.

Plant and Hog House

The compressor plant consists of three Ingersoll-Rand ES-1 compressors, each capable of delivering 1,080 cubic feet of air a minute at 38 pounds pressure. Two compressors were used towards the end of the shaft excavation.

The hog house is of concrete block construction and contains showers, sleeping quarters and sanitary conveniences for twelve men per shift. It is heated by four Beacon hot-water heaters and a Peerless oil burner. A medical lock is located in a building adjoining the hog house. A doctor is in constant attendance and hot coffee is supplied for the men.

Work at Other Shafts

The shaft on the south side of Chelsea Creek was started with 40-foot steel sheet piling, and at a depth of 38 feet steel liner plates and ribs were used for lining the 23-foot diameter shaft. Difficulty was encountered in driving the sheet piling due to riprap at about 20 feet below the surface of the ground. As this shaft is only about 30 feet from Chelsea Creek, water from the creek flooded the shaft and delayed progress at this point. It has been possible to work only about 2 hours at low tide. This difficulty was overcome when the steel sheeting was fully driven.

The shaft for the connection to the pumping station, located still further south of Chelsea Creek, is 82 feet in

depth, 18 feet in diameter and is lined with steel liner plates and ribs. This excavation was made in hard pan, with no ground water evident.

Personnel

Section 101 of the North Metropolitan Trunk Sewer was awarded to the C. & R. Construction Co. of Boston, Mass., on its low bid of \$608,538.18. Arthur Langevin is Superintendent for the contractor on this difficult section. For the Sewerage Division, Metropolitan District Commission, of which Joseph P. Dever is Chief Engineer, Walter Corsano is Resident Engineer.

New 1-Yard Shovel

A new 1-yard full-revolving crawler-mounted shovel, known as the Model 41, has recently been announced by the Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill. This new shovel incorporates a number of new principles of design and construction as well as embodying Northwest basic features.

The upper and lower bases of this new shovel are special heat-treated alloy steel castings; all high-speed shafts are mounted on ball or roller bearings; practically all gears are enclosed and run in an oil bath; uniform pressure clutches of the cone type are employed for swing, travel and boom hoist; the boom hoist mechanism is of the worm gear safety type; steering is by the differential methods, giving positive traction whether the shovel is traveling straight ahead or turning; and Feather-Touch booster clutches are employed on the main drum clutches.

The shovel boom is of the split type with a single square stick of unusually large cross section. The dipper is of 1-yard capacity and has a cast manganese front. The crowding mechanism is the Northwest patented dual crowd incorporating both an independent and automatic crowd.

The machine is readily convertible from a shovel to a crane, dragline or pull-shovel, and can be shipped completely erected on one flat car.

ON BIG CONCRETE JOBS
THEY'RE SAYING—

*"tie faster with
Richmond Ties"*

*Big Dams like
CHICKAMAUGA
and
TYGART VALLEY
are Richmond-Tied*

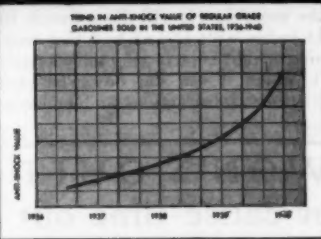
See "Sweet's" 3-51.



RICHMOND SCREW
ANCHOR CO., INC.
250 Bush Street
Brooklyn, New York

TIP ON TRIP TIME

*More efficient use of fuel
through higher compression
ratios and correct ignition
timing decreases trip time 7%
to 8% in 95,000-mile truck test*



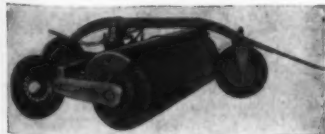
MAIL COUPON FOR
TEST RESULTS BOOKLET

Ethyl Gasoline Corporation,
Chrysler Building,
New York, N. Y.
Please send me a copy
of "Results of Recent
Road and Laboratory
Tests on Commercial
Engines" which gives
complete data on the
San Bernardino tests.

Name _____
Address _____

C&E-3

GRACE TWO-WAY ROAD SWEEPER



Also the
RAPID FIRE HEATER
for Tank Cars of Asphalt
DRAG BROOMS

Write for literature

W. E. GRACE MFG. CO.

6000 Holmes St.

Dallas

Texas

A TWO-YEAR SERIES of commercial vehicle tests with high and low compression ratios were recently completed at the San Bernardino, California, laboratory of the Ethyl Gasoline Corporation.

The facts regarding trip time gathered from these tests should prove of value to every fleet operator.

TEST RESULTS: With the higher compression ratio, trip time to travel identical test routes decreased by 7% to 8%; fuel consumption was reduced by 9% to 17%.

TIME-SAVING TIP: With the increase in the average anti-knock rating of "regular" gasoline today, many truck and bus operators have an opportunity to reduce time of road trips and operate more uniform schedules by:

1. Installing high compression pistons or cylinder heads (as supplied by the manufacturer) in older vehicles when engines are overhauled or rebuilt.

2. Advancing the spark as far toward maximum power as today's better gasolines will permit in vehicles with high compression engines.

3. Investigating compression ratios available when purchasing new equipment and specifying a ratio high enough to take full advantage of modern gasoline.

Increases in performance obtained in this way may also be used to haul heavier payloads and reduce fuel consumption if shorter trip times are not practical. Ethyl Gasoline Corporation, Chrysler Building, New York, N. Y., manufacturer of anti-knock fluids used by oil companies to improve gasoline.

• For detailed information as to how the tests mentioned above were made, the routes used and the results in fuel economy and time saving, send for the new, free booklet, "Results of Recent Road and Laboratory Tests on Commercial Engines." It's yours for the asking.

Roadside Planting By Contract in Ohio

(Continued from page 23)

tract would have been a necessity, because of the length of the job and the restriction on seeding dates. The contractor for this work, the W. A. Natorp Co., was nominated by the Ohio Department of Highways for the Central Section Award of the 1939 CONTRACTORS AND ENGINEERS MONTHLY Roadside Development Awards, for his efficient work on this project. In describing Natorp's work, the state highway engineers pointed out that by a careful analysis of the needs and requirements of the work, careful attention to the details of supervision, and the introduction of new methods and seeding equipment, the contractor was able to fulfill properly all items of the specifications and complete the project in slightly over one month, only one day having been lost because of adverse weather conditions.

The principal innovation was the use of the seed drill, a piece of equipment not heretofore used on roadside work in Ohio. This drill proved very suitable for use on a location such as this where a considerable amount of flat area is involved. It is planned by the Department of Highways to recommend further study of the use of this seeding equipment as an economical and efficient means of providing proper seeding to insure a good stand of grass.

The Toro tractor used to pull the drill was also used for small hauling jobs, thus "doubling up" the equipment. Throughout the project, the contractor realized the necessity and advisability of putting on a sufficient force of men with competent supervision in order to push rapidly such work as this which involves such a perishable type of material.

Personnel

This 6-mile roadside-improvement contract on State Route 35 in Ohio was completed in record time by the W. A. Natorp Co. of Cincinnati, Ohio. Dallas D. Dupre, Jr., is Landscape Architect for the Ohio Department of Highways, and this work came under the supervision of H. H. Kennedy, Division Landscape Architect for that section of the state.

New Small Ditcher Easily Maneuvered

The new Model 410 Buckeye ditcher is small enough in size to avoid overhead obstructions, get through between buildings and not to be a traffic hazard. At the same time it will dig a trench 18 to 24 inches wide and up to 6 feet deep, making it particularly adaptable to city work where it can dig down between underground obstructions and undercut



The new Model 410 Buckeye ditcher.

driveways and other surface obstructions.

Unit type construction is used throughout the machine so that any unit may be removed without dismantling others. The single lever steering control operates through multiple disc spring-loaded friction clutches and external contracting brakes. The Model 410 can be turned completely around in the radius of its own length or can make the slightest deviation in the trench line. The manufacturer states that it carries less weight per square inch of crawler ground contact than does the average man on his feet.

The boom is hoisted by means of hydraulic cylinders controlled by a single valve at the hand of the operator, and so arranged that the hydraulic pressure can be utilized either for hoisting or for crowding. It has digging speeds from less than 1/2 foot to 38 feet per minute. A 6-cylinder industrial type gasoline engine developing 50 hp at 1200 rpm drives the machine. The total width of the new Buckeye ditcher is 7 feet 10 inches, it is 6 feet 8 inches high and from out to out of crawlers is only 57 inches wide.

Complete information regarding the Buckeye ditcher may be secured direct from the manufacturer, The Buckeye Traction Ditcher Co., Findlay, Ohio, by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

New 1940 Mixer Catalogs

Four new catalogs describing and illustrating the 1940 line of Rex concrete mixers have recently been issued by the Chain Belt Co., 1666 W. Bruce St., Milwaukee, Wis., which will be glad to send copies of any of these bulletins on request.

Bulletin No. 360 describes the 3 1/2-S tilting mixer, features of which are the

new positive hand-wheel lock, adjustable Timken spindle bearings to keep the shaft and drum bowl in alignment, the new spring lock towing pole, and the exclusive Rex self-leveling front foot which is self-adjusting to slopes or uneven ground.

Bulletin No. 361 features the 5-S and 7-S mixers, made in either two or four-wheel, end or side-discharge models, with light or heavy-duty engines. Some of the features which are described and illustrated include the pressed steel drum heads and rollers, the mixing drum with oversize blades and buckets, the Rex vertical water tank with a free-way non-bypassing water valve, an outside pivoted discharge chute, and the Rex one-man end controls.

The 10-S and 14-S mixers are described in Bulletin No. 362, which also includes a description of the 14-S two-wheel trailer model which has a number of new features, including the new retractable outriggers and an adjustable towing pole.

"Rex Big Mixers for Modern Mixing Plants" is the title of Bulletin No. 363 on the 28-S and 56-S mixers, the features of which include replaceable bucket, blade and drum liners; high-carbon steel drum tracks; chilled face drum rollers; Rex chain belt drive; accurate water system; and the power unit mounted on top of the mixer high above the dirt line.

TARPAULINS ROAD MATS WINDBREAKS

CONTRACTORS' SUPPLY DEALERS in every state sell the Fulton line. Specify BUREAU-DEPT and FULTON Tents, Tarpaulins, and Windbreaks—anything made of canvas. Also Fulton Road Mats and Burlap. Fulton products are good and their prices are right.

If your dealer can't supply you write our nearest plant for names, samples and price list.

Fulton Bag & Cotton Mills

Manufacturers Since 1872

ATLANTA ST. LOUIS DALLAS

MINNEAPOLIS NEW YORK NEW ORLEANS PHOENIX CITY, ILL.

write
for
prices

**WHETHER IT'S WIDENING, PATCHING,
OR NEW CONSTRUCTION, BUFFALO-
SPRINGFIELD HAS A ROLLER TO FIT THE JOB**

**THE BUFFALO-SPRINGFIELD ROLLER COMPANY
SPRINGFIELD, OHIO**



BUFFALO-SPRINGFIELD

HERCULES

"CENTER-LIFT"

HOISTS AND DUMP BODIES

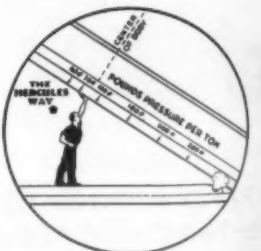
CENTER-LIFT is Easy Lift

Super Power Lifting far ahead of center to start load slowly. High speed with power at the finish.

The Hercules 6 inch hoist will "outlift" any 7 inch hoist which pushes back of load center.

No strain or push exerted against body hinges.

CENTER-LIFT IS EXCLUSIVELY HERCULES



WON'T QUIT or cause time out



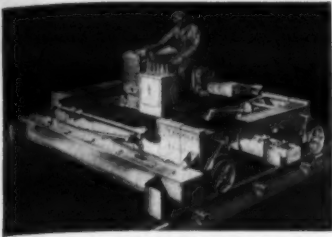
A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

The Hayward Company
32-36 Day Street
New York, N.Y.

Hayward Buckets

HERCULES STEEL PRODUCTS CO.

GALION, OHIO



The Jaeger 1940 Model Type H concrete finisher.

New Finisher Keeps Pace with Big Paver

The Type H de luxe concrete finisher recently announced by the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, is designed to keep pace with the 34-E dual-drum pavers and Jaeger screw spreaders on any width of slab. Both side trucks and center unit are completely self-contained, making it possible to furnish quick and easy built-in width changes up to 4 feet merely by extending the telescopic trusses and drive shafts and inserting screed sections. For major width changes up to 32 feet, it is necessary only to insert wider trusses, screeds and drive shafts. Width changes of $\frac{1}{4}$ inch to 3 inches require only the shifting of washers on the square axles.

One heavy-duty automotive-type transmission with working speeds up to 18 fpm and travel speeds up to 100 fpm performs all transmission functions. Smooth positive four-wheel drive, with equal load distribution on all wheels, is designed to provide maximum traction for these high speeds and for striking off stiff concrete. A feature of this finisher is the complete and easy control, all levers being banked and placed within easy reach of the operator from the front or the rear. Screed speeds are controlled independently of traction when gears are shifted but are synchronized with changes of speed by throttle. The screeds are driven by spring-cushioned connecting rods to eliminate jerking and are lifted separately or simultaneously by a fast hydraulic-power lift operated by a direct-driven pump and may be operated slightly raised for the first pass over dry material. The screeds are of box-type design, fully enclosed with two rows of crown adjusting studs, one row across the front, the other across the rear of the screed bottom to insure against warping and to provide a simple means of putting a positive tilt into the screed shoe. An improved quick crown change screed, which requires the movement of only one lever to change the crown overall, can be furnished.

For vibrating concrete, this finisher can be equipped to operate with either vibratory tube or vibratory motors mounted directly on the bull-nose front screed to insure deep internal vibration of the material.

Illustrated specifications may be secured direct from the manufacturer.

CONCRETE VIBRATORS

(Gas and Electric)

Concrete Surfacing Attachments



Master Vibrator Company, Dayton, Ohio
DISTRIBUTORS IN ALL PRINCIPAL CITIES

Bridge and Street Work "East of Suez"

(Photos on page 44)

Every country has its own way of doing things, and two illustrations on page 44 of this issue give us a glimpse of the way bridge and street construction are carried on in Bombay, India.

In laying the flooring for a bridge, metal sections of troughing are filled with wood aggregate impregnated with Lightfill compound. This Lightfill is a form of tar or asphalt and the aggregate must be of wood. After this wood aggregate is placed in the troughs and tamped into position, a seal coat of Lightfill seals and fills up the voids. Then the metal troughs are moved and placed into position on the bridge.

Although many customs and methods vary from one country to another, there is one which is approaching universality, and that is the use of American-made construction equipment. Turbaned and strangely garbed as these Bombay

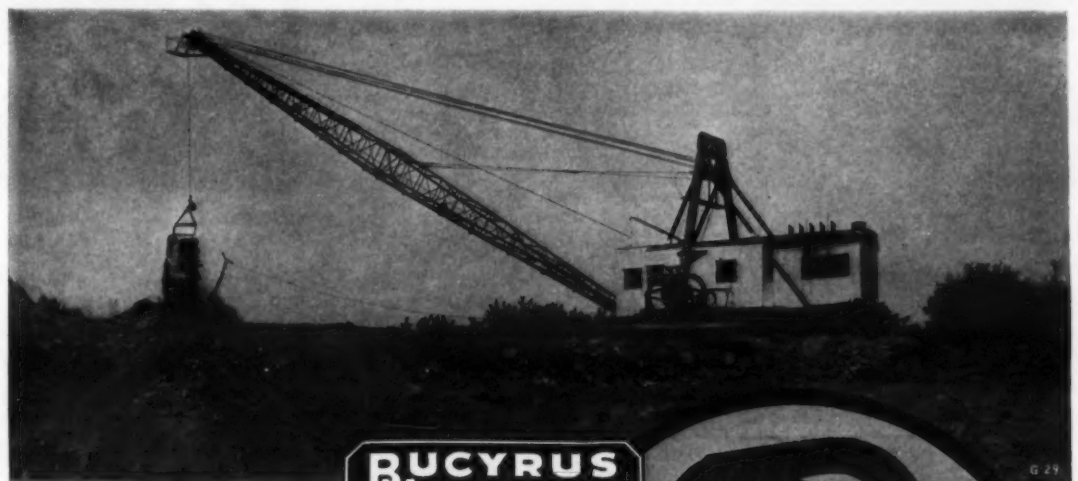
street workers may be, they are using a Littleford 84-HD asphalt kettle for applying bituminous material to the street. The operator there has a problem not usually faced by American workmen, but has solved this danger to his bare legs from hot spots of asphalt by wrapping torn-up gunny sacks around his legs to protect them.

Subgrade Important Item

In Good Highway Design

Subgrade bearing power is one of the most important features of present-day highway design, said M. R. Keefe, Chief Engineer, State Highway Commission of Indiana, in speaking on pavement design at the Twenty-Sixth Annual Purdue Road School in January.

By improving our subgrades we can lengthen the life of our pavements. This has long been a neglected feature, and even now many of our highway departments are passing over this question all too lightly.



**BUCYRUS
MONIGHAN**

A Walking Action That Lasts!

The exclusive Bucyrus-Monighan Rolling Cam gives a walking action that is smooth and positive; that "cushions down" the machine at the end of each step with an ease that means long life. The construction of the Rolling Cam is such that Bucyrus-Monighan walking maintains its efficiency even after long hard service, without need for constant adjustments. Here's the reason: The walking action is governed by the free-working cam rolling in its track, guided by deep double flanges

on the cam. The few moving parts are designed with liberal clearance between cam and track—effectiveness is not impaired with long use. This has been proven repeatedly in the field by Bucyrus-Monighans which step out as positively, as surely and as gently after million-yard service as they did when they were new.

Sold by

Bucyrus-Erie

SOUTH MILWAUKEE, WISCONSIN

ONAN Portable ELECTRIC PLANTS

ALTERNATING OR DIRECT CURRENT

ANY VOLTAGE ANY FREQUENCY

40 STOCK MODELS 350 TO 5000 WATTS



ONAN PORTABLE ELECTRIC PLANTS are used and endorsed by Private, City, County, State and Federal Engineers and Contractors. Operate anything electrical used in Construction and Maintenance—MOTORS, WATER PUMPS, DRILLS, SAWS, SANDERS, SURFACERS, TAMPERS, GRINDERS. From the small 350 Watt HAND PORTABLE MODEL to the 5000 Watt TRAILER TYPE, they're all STURDY, DEFENDABLE and "able to take it" on even the toughest jobs. Completely Water-proofed and Ignition Shielded, they'll operate continuously in any weather. THOUSANDS IN OPERATION IN ALL PARTS OF THE WORLD for hundreds of different uses. There's a Model for your jobs too.

Stationary Models to 50,000 watts. We've manufactured Electric Plants exclusively for over 14 years.

Write NOW—Let us know your needs—We'll send complete details.

D. W. ONAN & SONS

1227 ROYALSTON AVE.—MINNEAPOLIS, MINN.

Two New Vice Presidents Elected by Caterpillar

Announcement has been made by the Caterpillar Tractor Co. of the election of J. D. Fletcher, Export Sales Manager, and T. R. Farley, Assistant to the President, as Vice Presidents of the company.

Mr. Fletcher will continue as head of the Export Department, a position which he has held for the past 10 years. He is a Director of the National Trade Council, Inc. Mr. Farley, who at the present time is abroad studying export

markets, will retain his various administrative duties. He joined the Holt Mfg. Co., one of the predecessors of the Caterpillar Tractor Co., in 1919 and when the present company was formed, continued as an employee, rising steadily to his present position.

New Bulletin on Spaders

Sullivan spaders and trench diggers are illustrated and fully described in a new 4-page two-color bulletin recently issued by the Sullivan Machinery Co., Michigan City, Ind. The Sullivan M-2

spaders are built for tough jobs, including shaft sinking, tunnel and trench work, and for light demolition. They are ruggedly constructed with a strong well-protected joint connection to maintain alignment, and a special heat-treated steel retainer to resist wear from the spade.

Features which make for the comfort and safety of the operator include handle grips which fit the hand, an air cushion on the end of the cylinder to relieve jar, and exhaust ports so arranged that they deflect the exhaust away from the operator.

Copies of Bulletin 87-K describing these spaders and trench diggers may be secured direct from the manufacturer by mentioning this item.

New LeTourneau Adv. Mgr.

George C. McNutt, recently associated with the Bert S. Gittins Advertising Agency, has resumed his former position as Advertising Manager of R. G. LeTourneau, Inc., Peoria, Ill., to succeed George R. Huffman who resigned in March to return to the Pacific Coast.

BOULEVARDS or *Secondary Roads?*



STANDARD OIL

Asphalt

Is the "Answer"

● LOOKING FOR a tough, long-lived pavement that can "take" the steady beating of heavy boulevard traffic—or do you merely want a low-cost method of secondary road construction? In either case there's a type of asphalt construction that will "fill the bill" most economically.

Asphalt is economical because you don't have to pay the cost of boulevard pavement for secondary road

improvement. You can choose just the right type of construction to meet your local requirements. To make this selection easier Standard Oil has Asphalt representatives throughout the Middle West to consult with you on your particular needs. Get in touch with this Asphalt adviser. You can reach him through the local Standard Oil (Ind.) office, or by writing 910 S. Michigan Avenue, Chicago, Ill.

*Asphalt for
every purpose*

STANDARD OIL COMPANY

(INDIANA)



C. & E. M. Photo
View down the shaft, showing the muck car and the hydraulic pump on the concrete anchorage, for one section of the North Metropolitan Trunk Sewer.

Sewer Tunnel Driven Under Compressed Air

(Continued from page 2)

in. It had a 45-foot boom and was operated by a 3-drum Mundy hoist driven by a 40-hp General Electric motor. A Lorain 75-B crawler crane was used as an alternate for the stiffleg derrick. At the bottom of the shaft an I-R Tugger air hoist was used where necessary for pulling muck cars up grade to the bottom of the shaft.

The 45-ton shield was equipped with twelve Watson-Stillman jacks of 80-ton capacity each, 6½ inches in diameter, and giving a 40-inch shove. The material through which these two headings were driven was a wet clay with some sand. In the east heading the crew excavated for two rings, made a shove, installed the ring, immediately made the second shove and installed the second ring, while in the west heading excavation was carried ahead for only one ring. At each heading an I-R sump pump was installed to remove the water immediately. In the west tunnel, the smaller-diameter tunnel, the top jacks were never used on the shield because of the tendency of the shield to tip forward and thereby work down below the grade of the tunnel. From 10 to 12 minutes was required for a shove and only 2,500 of the 5,000 available pounds pressure was used on the shield in the east heading, for fear of crumpling the plates.

In order to check the movement of the shield immediately during a shove, a rather clever and simple device called the

Gile Canary was installed on the shield at the left side. This consisted of a plumb bob in a box mounted accurately with level bubbles and rules reading to 1/100th foot. A reading of 1/100th foot off center showed a 15/100th lead on the shield. This multiplication of the readings permitted great accuracy in operation of the west heading shield, which was slightly top-heavy.

The average crew in a heading consisted of three miners, two iron men and six muckers. All muck was loaded into 2-yard skips, carried on Koppel flat cars running on a single track through the tunnel with switches for a double track at the headings and the shaft. In the heading the miners used 2 x 10-inch breast boards braced to the shield and made from 12 to 13 feet progress per day of three 8-hour shifts. In order to prevent slipping in the clay on the deck boards beside the tunnel cars, pea gravel was lightly spread over the deck. Some difficulty was experienced with these headings because of sand streaks in the clay which not infrequently gave what in rock work would be termed "over-

breakage". This required a great deal of extra packing with gravel behind the rings to prevent settlement in the street.

Air for the operation of the air pumps in the tunnel and for clay spades was furnished by two Ingersoll-Rand portable compressors running in tandem and delivering to a single air receiver at the top of the shaft.

Liner Plates

The liner plates used by C. & R. Construction Co. were furnished by Commercial Stamping & Shearing Co., and consisted of ¾-inch plate measuring 16 x 37¾ inches and corrugated in the direction of the tunnel. They had 2-inch flanges and thirteen and one-half plates were used per ring. The rings were stiffened with 8-inch I beams curved to fit the inside of the tunnel and spaced 16 or 32 inches on centers.

Gravel Shooting and Grouting

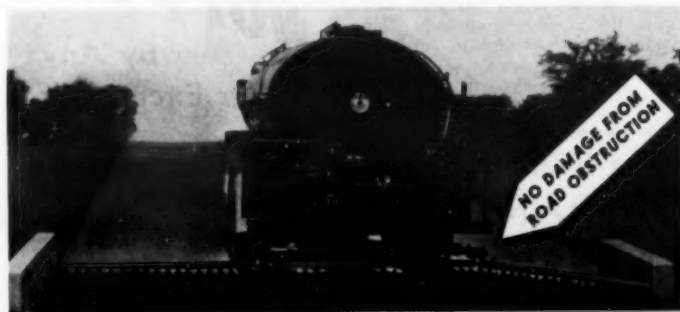
A pneumatic gravel shooter made by Silas Mason Co., contractor for Sections 102 and 103, was used by C. & R. Construction Co. The pea gravel was shot behind the rings on alternate shoves in the west heading and at every shove in the east heading. The bags of pea gravel as delivered to the job contained 0.7 cubic feet per bag and an average of thirteen bags of gravel was used per linear foot of tunnel.

Grout holes in the rings numbered two or three in alternate rings. Grout was applied about ten rings back of the face at a pressure of 80 to 100 pounds per square inch, using a 1:2 mix.

Personnel

The contract for Section 104B was awarded to C. & R. Construction Co., Boston, Mass., on its low bid of \$515,821.99. For the contractor Francis Kelly and Angus MacDonald were Superintendents. For the Sewerage Division, Metropolitan District Commission, of which Joseph P. Dever is Chief Engineer, George Gile was Resident Engineer on this section.

IT'S EXCLUSIVE! IT'S AMAZING! "NO-DRIP" Turn-Up SPRAY BAR



Hailed as America's outstanding spray bar, Etnyre's "NO DRIP" Turn-Up Bar is almost human in action—raises, folds, can be shaped to road crown, turns up for cleaning, deflects to avoid damage from road obstructions, permits spraying through either side, can be made up in any width up to 24 feet, shifts to follow edges of road. Another "MORE FOR YOUR MONEY" Etnyre feature! To get the complete story, see your dealer or write today for new "FOTO-FACTS" pictorial catalog.

E. D. ETNYRE & CO., Inc.

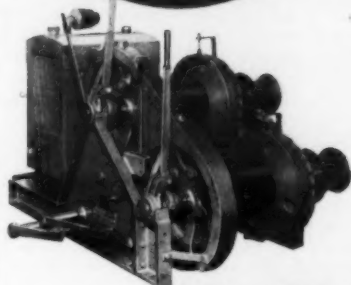
Oregon, Illinois, U. S. A.

ETNYRE

BLACK TOPPER

ROAD BUILDING SYSTEM

MORE HOIST FOR LESS MONEY



THE MODEL

20

A M E R I C A N General Purpose Hoist

has many features found in no other hoist in its price class — Stand-out superiorities which lift it high above all competitive hoists of corresponding capacity:

For instance:

1. Frictions and brakes are at opposite ends of the drum for cool running.
2. Shrouded ratchet ring with chisel type dog.
3. Drive shaft turns in anti-friction bearings and is placed between the drums — both drums revolve in the same direction.
4. Improved band type frictions: easy to engage; economical.

In a word — MORE HOIST FOR LESS MONEY. Write for Bulletin No. 100-H-0.

AMERICAN HOIST & DERRICK CO.

NEW YORK SAINT PAUL, MINN. CHICAGO

AMERICAN TERRY DERRICK CO.
PORT HARTNEY, N. S. W.

for safe WIRE ROPE
FASTENINGS
genuine CROSBY CLIP

PILE HAMMERS and EXTRACTORS HOISTS-DERRICKS WHIRLERS

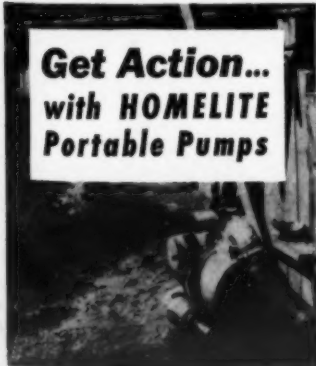
Special Equipment
Movable Bridge Machinery

Write for descriptive catalogs.

McKIERNAN-TERRY CORP.
19 Park Row, New York

Distributors in Principal Cities

Get Action... with HOMELITE Portable Pumps



SPEED is the word for Homelite Portable Pumps. They're easy to get around—weigh only 88 pounds complete with gasoline engine. Yet they pump 15,000 gallons per hour. They're fast self-primers. Have a 25-foot suction lift. Handle sewage automatically. Non-clogging. Built for toughest service. Thousands are saving time and money for contractors and engineers everywhere. Send for bulletin.

Homelite Corporation

1885 Riverdale Ave., Port Chester, N. Y.

Illinois Paving Job Moves at Fast Pace

(Continued from page 17)

source was a creek and then a sump from which the second pump took suction. Very little ground water, if any, entered the sump at Eldena.

Steel and Expansion Joints

On this contract there were no contraction joints, only expansion joints spaced every 50 feet. This made for uniformity anyway, as far as the organization of the job was concerned. The center steel for the plane of weakness was Laclede steel in 10-foot lengths with tie bars threaded through the center steel at intervals of $2\frac{1}{2}$ feet. These bars are $\frac{1}{2}$ -inch deformed steel $2\frac{1}{2}$ feet long and set with metal pins for support at the ends.

The 1-inch premoulded expansion-joint material was placed with a 2-inch cap to insure an even line at the top and with the joint material buried 1 inch in the subgrade and reaching to within $\frac{1}{2}$ inch of the top of the pavement. It was set with six heavy clips over the top and pins on each side of the clips. The dowels through the expansion joint were $\frac{3}{4}$ -inch round, 2 feet long and spaced 12 inches apart with Laclede compression caps on one end of each dowel, alternately toward and away from the paver. The transverse tie bar was welded to chairs which carried two dowels.

The two wheels at each end of the Ted Carr strike-off for the fabric reinforcement were equipped with eccentric axles and levers so that the strike-off could be lifted over the expansion joints and not disturb them. The wire mats were 13 x 11 feet and consisted of $\frac{3}{4}$ -inch rods longitudinally and $\frac{1}{4}$ -inch bars transversely spaced 6 and 12 inches respectively. The steel crew which set the center steel with metal guides from the forms carried the required pins and tie bars along with them in a wheelbarrow.

Finishing and Curing

The Ord 22-foot finishing machine with a double screed, driven by a 4-cylinder motor, had crawler traction on the forms with the usual flanged wheels for guiding the machine only. This machine

was followed by a 12-foot Ted Carr longitudinal bull-float run by two men from a rolling bridge held securely in place by bent tie rods while they were working on it.

Behind the bull-float were three finishers using two Heltzel straight-edges for dragging and checking the surface, then edging the sides, cutting and edging the joints and pulling an 8-inch canvas belt. The final operation was to broom the surface to provide a non-skid texture.

The curing was handled by four men who first placed damp burlap on the surface, sprinkled the burlap, and then the next morning removed it and covered the concrete with 24-foot widths of Sisalkraft paper rolled around 2 x 4's for ease in handling and in 50-foot lengths. This was laid over the edge when the forms were removed by the same crew and sealed with earth shoveled from the shoulder. These same men also poured the joints with asphalt to seal the top.

Batching

The batching plants for aggregates and cement were located in Eldena at about the center of the job on a main line of the Illinois Central Railroad, but a spur around the line made it possible for the heavy freights to move through on slow orders without disturbing the batching operations. The cars at both batching plants were shifted as required by an International tractor with a long cable. A P & H crane with a 50-foot boom and a $1\frac{1}{2}$ -yard Williams clamshell bucket unloaded the gravel and sand, with two men in the cars to clean up. These aggregates were placed in the bins at the Blaw-Knox weighing batcher plant and weighed out by the one man on the plant.

The bulk cement was received in special hopper-bottom freight cars and unloaded into the screw feed of the Butler bulk-cement plant and thence up the bucket elevator, also powered by the LeRoi engine, to the storage bin at the top above the weighing batcher. A small compressor was used to keep the cement clear for weighing.

The batch trucks received their two batches of aggregates and then returned to the cement batcher and, after receiving the cement, went to a platform close by where a man carefully covered the cement with the sand of the batch.

Personnel

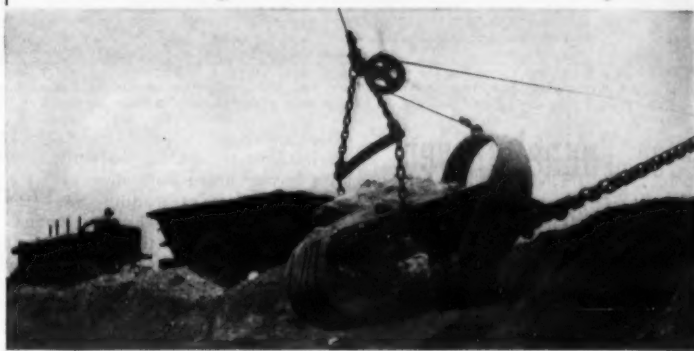
This contract for 6.51 miles of 22-foot pavement through Eldena, Ill., from Illinois Route 26 to U.S. 52 was awarded to Edw. M. Rocho of Freeport, Ill., on his low bid of \$235,398.43. The job was run with two shifts from 5 a.m. to noon, and noon to 7 p.m., under the direction of G. W. Giffrow as Superintendent. H. C. Reeder was Resident

Engineer for the Illinois Division of Highways.

New Heil Representative

Karl Mindeman, who has been with the sales department of the Heil Co. at the home office in Milwaukee, is now working out of the New York and Boston branch offices as Connecticut representative of that company.

For greater dragline yardage use a Page Bucket on the job!



Dragline buckets for all types of work • Capacities $\frac{3}{4}$ to 15 cubic yards

There's a reason why more Page Dragline Buckets are used than any other make. By their yardage records on all types of work, Page Buckets have established a reputation of being able to outdig

other buckets of equal size and weight. Get the greatest yardage possible from your dragline machine—dig with a Page Automatic Bucket! See your equipment dealer or write us for more information.

PAGE ENGINEERING COMPANY

Page Automatic Dragline Buckets • Page Walking Dragline Machines
CLEARING POST OFFICE, CHICAGO, ILLINOIS

CONTROL NOT EQUALLED

by Any Other Excavator

Here's direct "feel" of the load at all times. Here's quick, cushioned response that protects against jerky operation and damaging jolts. And here's new ease of operation with a central control station where everything's reached as easily as the controls of your car—and no more physical effort is required.

The new P&H Excavator control—simple and dependable—makes possible new advantages for the owner, such as full floating brakes, automotive type clutches, electric dipper trip and other features that step up operations and knock down digging costs. This new control, offered on P&H $\frac{3}{4}$, $1\frac{1}{2}$ and $3\frac{1}{2}$ yd. machines, is fully described in Bulletin X-60. Write for your copy.



This P&H Model 100 ($\frac{3}{4}$ yd.), equipped with the new P&H control, is at work on a big sand-digging job. The owner reports that the machine recently completed 1500 hours of operation without a brake adjustment. Full floating brakes with full wrap bands make such outstanding records possible. P&H Excavators are built in 18 different sizes, from $\frac{3}{4}$ to 5 cubic yards capacity... gasoline, Diesel or electric power. Literature is available on all models.

P&H EXCAVATORS

General Offices: 4419 W. National Avenue, Milwaukee, Wisconsin

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SELF-ALIGNING and SELF-FASTENING

EXPANSION JOINT

Assemblies for Concrete Paving

1. The Trusses support any size or kind of joint filler in rigid, vertical position.
2. Removable Filler Shield held to line and grade by trusses.
3. Two flat continuous parallel supports equalize the subgrade contour and prevent settlement.
4. Four continuous parallel supports grip the subgrade and prevent any movement. No danger of displacement during the placing and working of concrete.
5. Trusses with narrow horizontal surfaces eliminate the hazards of air pockets and planes of weakness.
6. Uniform and accurately gauged socket clearance.
7. No fastenings and a minimum of socket friction allow each side of assembly to move with new shrinking concrete—this prevents checking of concrete.



- Rigidly welded assembly assures the necessary alignment and levels of all trusses and filler.
- Trusses tested to transmit 12,000-lb. wheel loads in either direction.
- Installing an 11-foot assembly requires less than two minutes for one man.

THE W. S. GODWIN CO., Baltimore, Md.

Preparing Roadways For 1940 N. Y. Fair

Repair and Reconstruction, Made
Necessary by Foundation Settling
and Installation of New Services,
Done by Contract

(Photo on page 44)

THE more than 1,000,000 square yards of paved area at the World's Fair of 1940, in New York, is now in excellent condition, according to E. J. Carrillo, Director of Maintenance at the exposition grounds. During the late winter and spring months, engineers and working crews have made it ready for the season of tremendous vehicular and pedestrian traffic beginning with the Fair's opening on May 11.

Under Mr. Carrillo's direction, the work was divided into two main classifications, rehabilitation and improvements, the combined demands of which have been considerable. Maintenance of underground utilities and the installation of additional similar services necessitated numerous street openings. Besides this, the severe winter to which the pavement was subjected caused cracking and disintegration in some sections of the 1,216 acres of man-made ground which the Fair occupies. The basic job, therefore, was that of repair work and reconstruction.

Inspection also disclosed that in certain areas, because of the nature of the foundation, the pavement had subsided. All such conditions were carefully checked up and the necessary work was done to restore the surfaces to the proper grade.

The many additions to the 1940 Fair's exhibits and entertainment spectacles also involved corresponding alterations in the paved area of the grounds. New pavement was installed on areas which formerly had been landscaped. This was done to meet the demands for additional walking space at various focal points of the exposition.

Among the improvements was included the elimination of sharp corners which a study had shown were a hindrance to the smooth flow of vehicular and pedestrian traffic. The result of this is that traffic conditions, which were the subject of much favorable comment during the Fair's 1939 run,

are now even better than before. Also under the classification of improvements was the installation of additional storm water drains, wherever needed, to speed up the run-off of water caused by heavy rains.

At the very beginning of the Fair's construction work, anticipating the requirements of new exhibits and concessions as well as of alterations and repairs, the engineers recognized the necessity for an easily repaired pavement. They realized also that, due to the nature of the site, some slight settlement, at least, was inevitable under the load imposed by the many structures. It was evident, therefore, that the paved surface must also possess flexibility. Accordingly they chose a fine grained asphalt macadam which, in addition to meeting the afore-mentioned exigencies, was smooth enough to be satisfactory for rubber tires and shoe leather, yet with sufficient grain to prevent slipperiness when wet.

Performance of the pavement is a tribute to the extreme care taken in the

selection of materials and in determining the most satisfactory type of construction. All necessary repairs and alterations have been made speedily and efficiently by the William McDonald Construction Co., of Flushing, N.Y., which had the contract for most of the original paving, and the entire paved area is ready for a season of even greater traffic than that encountered at the Fair last year.

New Link-Belt Sales Mgr.

Announcement has been made by the Link-Belt Speeder Corp., Chicago, Ill., manufacturer of shovels, cranes and draglines, of the appointment of Hayes Parsons as Sales Manager for the corporation. For several years, Mr. Parsons has represented the Speeder Machinery Co., and then the Link-Belt Speeder Corp., in the Seattle district.

"ETHICS"

"FLEX-PLANE" finishing and joint installing machines are backed by honesty without misleading statements or condemning competitors' equipment.

All worth-while features are found in "FLEX-PLANE" equipment, plus exclusive features—great adjustability, sectional screed, tapered screed wings, etc.

FLEXIBLE ROAD JOINT MACHINE CO.
WARREN, OHIO

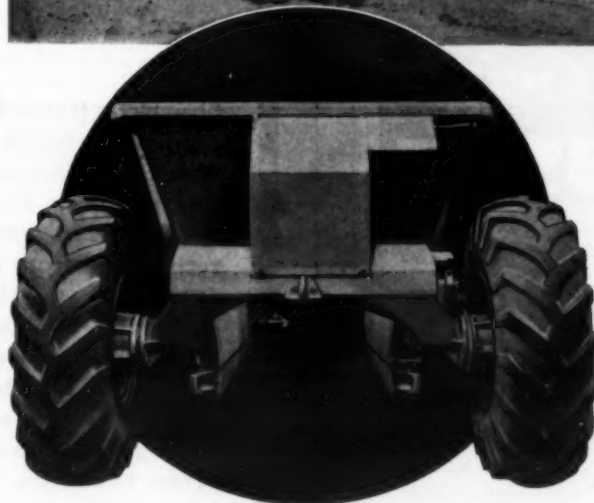


SAVE SECONDS on the fill!



EVERY SECOND SAVED... REDUCES HAULING COSTS

Instantaneous dumping of the load—exactly where it is wanted—at traveling speed, saves time on every trip. The Koehring Trail-Dump high arched, rear body construction with free swinging, gravity impelled doors, permits "getting off the load" without reduction of traveling speed. Doors are curved and well reinforced to provide maximum strength. Dumping lever—conveniently located—releases doors instantly—also engages mechanically simple "automatic hand" for positive door closing. "Automatic hand" stops operating automatically when doors are closed or become jammed with large stones or frozen dirt.



Maximum ground clearance of open doors, and high arched rear body construction, provide sufficient load clearance when dumping. Doors are curved for maximum strength. Free swinging, gravity impelled doors are released instantly for dumping.



KOEHRING COMPANY • MILWAUKEE, WISCONSIN

HEAVY-DUTY CONSTRUCTION EQUIPMENT

A Complete Line

OF

ASPHALT PLANTS

- 500 lb. Batch Capacity Plants
- 1000 lb. Batch Capacity Plants
- 2000 lb. Batch Capacity Plants
- 3000 lb. Batch Capacity Plants
- 4000 lb. Batch Capacity Plants
- 6000 lb. Batch Capacity Plants

Madsen offers you 25 years of continuous manufacturing experience in asphalt plants, dryers and appurtenant equipment. If you want the plant that makes the record, you will want a Madsen Plant. Write for catalog.

MADSEN IRON WORKS

5631 Bicket Street
HUNTINGTON PARK, CALIFORNIA



One of the ornamental features of the Henley Bridge is this prow of a classical Roman galley at the east approach to the bridge. At the west end is a similar pylon representing the stern.

Attractive Features Of Canadian Bridge

(Continued from page 21)

was put into the enclosure at the bottom by means of perforated steam pipes connected to a small steam boiler. Steam pipes were also run along the curbs away from the concrete. The lowest temperature of the air during the concreting last winter was 4 degrees above zero but normally the temperature ran from 30 to 40.

Miscellaneous Items

The beam approach spans on both bridges were completed in the fall of 1938 as a matter of economy on the part of the contractor. The abutments consist of U-shaped structures back-filled with earth and with ornamental stone-work approaches.

The footings on some of the piers not described were spread slightly because of the character of the foundation material found during excavation. These changes were not large in any case. Very little water was encountered in the blue clay and hardpan, hence there was very little pumping required to keep the excavation dry. On Pier No. 1 of the south bridge there was a little trouble with a small earth slide due to a change

in the design which carried the excavation lower and into a streak of quicksand and blue clay. The original cofferdam was not adequate to hold the deeper excavation against the slide. At this point the footing was made larger and carried deeper.

A portion of this contract required the pouring of a section of concrete pavement. For this pavement the batch weights were: stone, $1\frac{1}{8}$ to $\frac{1}{2}$ -inch, 1,382 pounds; stone, $\frac{1}{2}$ to $\frac{3}{10}$ -inch, 690 pounds; sand, 1,232 pounds; water, 29.9 gallons per batch; cement, 7 bags; the batch being designed for maximum density. This was one of the first contracts in Ontario using two sizes of stone.

East and West Pylons

To place emphasis upon the bridge and the importance of its location on the famous Henley Course, ornamental features with flanking stone walls were designed by the office of W. L. Somerville, Architect, of Toronto, in association with the engineers of the Ontario Department of Highways. The motifs used consist of central pylons representing the stern and prow of a classical Roman galley, surmounted by flagpoles.

The prow faces east, and has the Ontario coat of arms as the central feature. The support for the flagpole base is surrounded by the four shields of the other eastern provinces of Canada: Quebec, Nova Scotia, New Brunswick and Prince Edward Island. On the stern at the west approach are the Royal Arms of Queen Elizabeth and the four shields of the western provinces: Manitoba, Saskatchewan, Alberta and British Columbia.

On the pylons on either side of each of the two central features are carved stone panels representing the types of water transportation used over this waterway at different periods of the past, including an Indian canoe, French bateau, the first sailing vessel with steam auxiliary, and the oarsmen typical of the Henley rowing regatta.

Personnel

This new dual bridge on the Queen Elizabeth Way across the old Welland Canal at the start of the Canadian Henley Regatta course was built by The Goldie Construction Co., Ltd., of Toronto, Ontario, for the Ontario Department of Highways. E. C. Goldie is President of the contracting organiza-



A close-up of the prow of the galley, showing the Ontario coat-of-arms carved in Queenston limestone.

tion and H. McCaffrey was Superintendent on this contract. For the Ontario Department of Highways, Arthur Sedgwick is Bridge Engineer, Victor Murray, Design Engineer and H. Weller, Chief Inspector. R. W. Bishop was Resident Inspector on this project.

10-S Mixer Has Many New Design Features

The Koehring 10-S Dandie mixer for 1940 has a number of new design features. One of these is the rubber-tired drum roller which is claimed to reduce drum roller track wear almost to the point of elimination. Drum mixing impacts are absorbed and the drum revolves in a resilient cradle formed by the rubber-tired rollers. The four-wheel

model is quickly interchangeable for either end or side charging and discharge, to suit job conditions. Platform-type leaf springs support the mixer frame for either type of operation, without changing the wheel location or direction.

Copies of the new illustrated bulletin on the 10-S Dandie mixer may be secured direct from the manufacturer or from this magazine.

Specialized Lubrication For Tractors and Trucks

Economy in lubrication, from 10 to 50 per cent savings in grease and oil bills, is featured in a recent folder issued by D-A Lubricant Co., Inc., Indianapolis, Ind. This line of 100 per cent Pennsylvania lubricants, each specially prepared for its type of service, is produced by a company which specializes exclusively in the lubrication of tractors and trucks.

Copies of a recent folder on D-A lubricants and answers to your lubrication problems may be secured by writing direct to D-A Lubricant Co. and mentioning this magazine.

Be sure it's the

**GIANTGRIP
STRAIGHTEDGE**

Either Steel or Aluminum

For Checking Concrete Surface

Two useable edges:—one sharp-cornered and squared for scraping; the other rounded for line-point straightening.

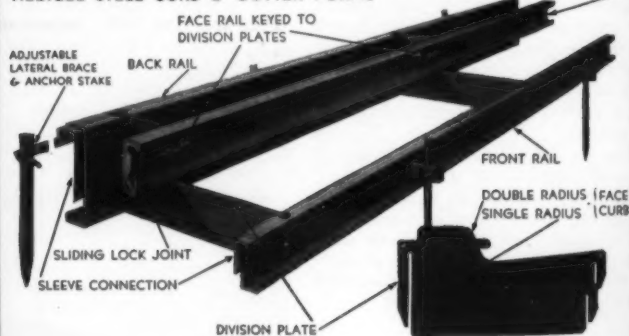
ASK YOUR DEALER

L & M Manufacturing Co.

(Division of Meeble Forge Co.)

10302 BEREA RD., CLEVELAND, OHIO

HELTZEL STEEL CURB & GUTTER FORMS



The New Heltzel Heavy-Duty Steel Forms for constructing combined curb-and-gutters. Face forms are removed without disturbing the front and back forms or the division plates — greatly facilitating the hand finishing operations on the face curb. Quick easy adjustments for setting to line and grade. Write today for complete information or quotations and catalog 5-20.

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BUILDS IT BETTER

BINS Portable and Stationary
CEMENT BINS, Portable and Stationary
CENTRAL MIXING PLANTS
BATCHERS (for batch trucks or truck mixers with automatic dial or beam scale)
BITUMINOUS PAVING FORMS
ROAD FORMS (with lip curb and integral curb attachments)
CURB FORMS
CURB AND GUTTER FORMS
SIDEWALK FORMS
SEWER AND TUNNEL FORMS
CONCRETE BUCKETS
SUBGRADE TESTERS
SUBGRADE PLANERS
TOOL BOXES
FINISHING TOOLS FOR CONCRETE ROADS

Get the right lift with NOVO HOISTS



GASOLINE, ELECTRIC OR DIESEL POWER
2 to 65 HP.

NOVO ENGINE CO.
LANSING, MICH.

For they have—

NOVO SMOOTH ACTION—Double cone friction blocks take hold smoothly with a sure, quick action. The double area gives greater efficiency.

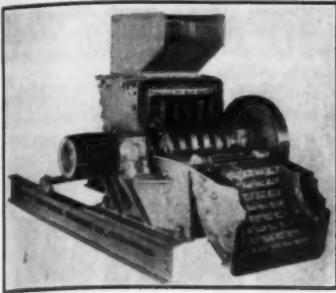
NOVO FEATHER-TOUCH CONTROL—The screw thrust puts a higher leverage behind the shifter rod. Screw assembly runs in oil.

NOVO SELF-ENERGIZING BRAKES—The drop of the load helps set the brakes, resulting in easy control.

NOVO QUALITY HOISTS—All sizes have chrome-nickel alloy construction and welded steel base. Silent chain drive above 30 HP.

NOVO ENGINE CO., 218 Porter, Lansing, Michigan
Send full information on Novo Hoists: Size
Name Address City State

HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO · U. S. A.



View of the interior of the Universal No. 2 pulverizer.

New Roller-Bearing Rock Pulverizers

Sizes No. 2 and No. 3, of the steel-plate roller-bearing rock pulverizers made by the Universal Crusher Co., Cedar Rapids, Iowa, are particularly adapted to the production of rock in varying sizes for use in black topping, aggregate for asphaltic and portland-cement concrete, and similar road uses.

To overcome any difficulty from overheating, Universal pulverizers have one floating bearing and one stationary bearing, to allow for the expansion which naturally occurs in the shaft when in operation. Shafer self-aligning bearings are used with oil-proof piston ring seals and auxiliary dust collars on both sides of the bearings. All bearings are Ale-mite high-pressure-lubricated, and are easily removed or replaced.

The frame is of welded high-tensile steel-plate construction, and is provided with an upper hinged section to facilitate inspection and cleaning. No. 2 and 3 pulverizers have a removable ribbed cast steel front to impart extra rigidity and to facilitate attachment of the breaker plates. The high-tensile steel hoppers are removable, and the No. 2 and 3 models are equipped with baffle bars which protect the operator against flying fragments of rock. The manganese-steel breaker blocks are adjustable by means of three large screws. The hammers are of two designs, the bull-head type for pulverizing ordinary limestone and soft materials, and the bar type for crushing rock and harder materials. All hammers are of manganese steel and are reversible to insure maximum wear. The grates are of high-quality manganese steel, cast in one piece, and are available in either the bar or block types for fine or coarse crushing.

The construction and operating features of these Universal pulverizers, which are available mounted on trucks with bucket elevators as a portable unit, are described and illustrated in Bulletin No. 400, copies of which may be secured direct from the manufacturer.

Roller Co. Celebrates Its Tenth Anniversary

In January, 1930, the Hercules Co. first announced its line of three-speed road rollers. Since that time, this company has also brought out its Ironeroll road roller, equipped with an auxiliary roll of small diameter attached to the rear end of the main roller frame and operated hydraulically.

Copies of Catalog No. H-4001, describing and illustrating the features of the line of gasoline or diesel-powered Hercules road rollers may be secured by contractors and state and county highway engineers direct from the Hercules Co., Marion, Ohio.

GIANT-size pile driving jobs shrink to pigmy proportions when

UNION PILE HAMMERS

tackle them!

Interchangeable base equipment on all UNION Hammers makes it easy to drive any size steel pipe or fluted casing for concrete piling.

For the latest in Pile Driving Equipment, consult the NEW UNION Booklet No. 184—JUST OUT.

UNION
IRON WORKS, INC.
P.O. Box 15, Elizabeth, N. J.



Too Tough?

NOT FOR A FORD TRUCK!

● When the going gets really tough, put a Ford Truck on the job and watch it perform. These big, rugged units are built to take hard work — and like it! They're trucks, every inch of them, with big, massive frames, axles, springs, brakes.

Power? Smooth, dependable, eight-cylinder power with a choice of three efficient truck engines — 95, 85 and 60 hp.

And economy! From the Model T to today's giants, the Ford Truck has showed the way to real dollar-saving performance. It gets to the place it's going in a hurry and is back for more payload and more trips per day.

From the toughest to the smallest hauling and delivery job there's a Ford Truck to give you this kind of economy. There are six wheelbases, forty-two body and chassis types, and a wide choice of special equipment, including optional axles, transmissions and larger tires.

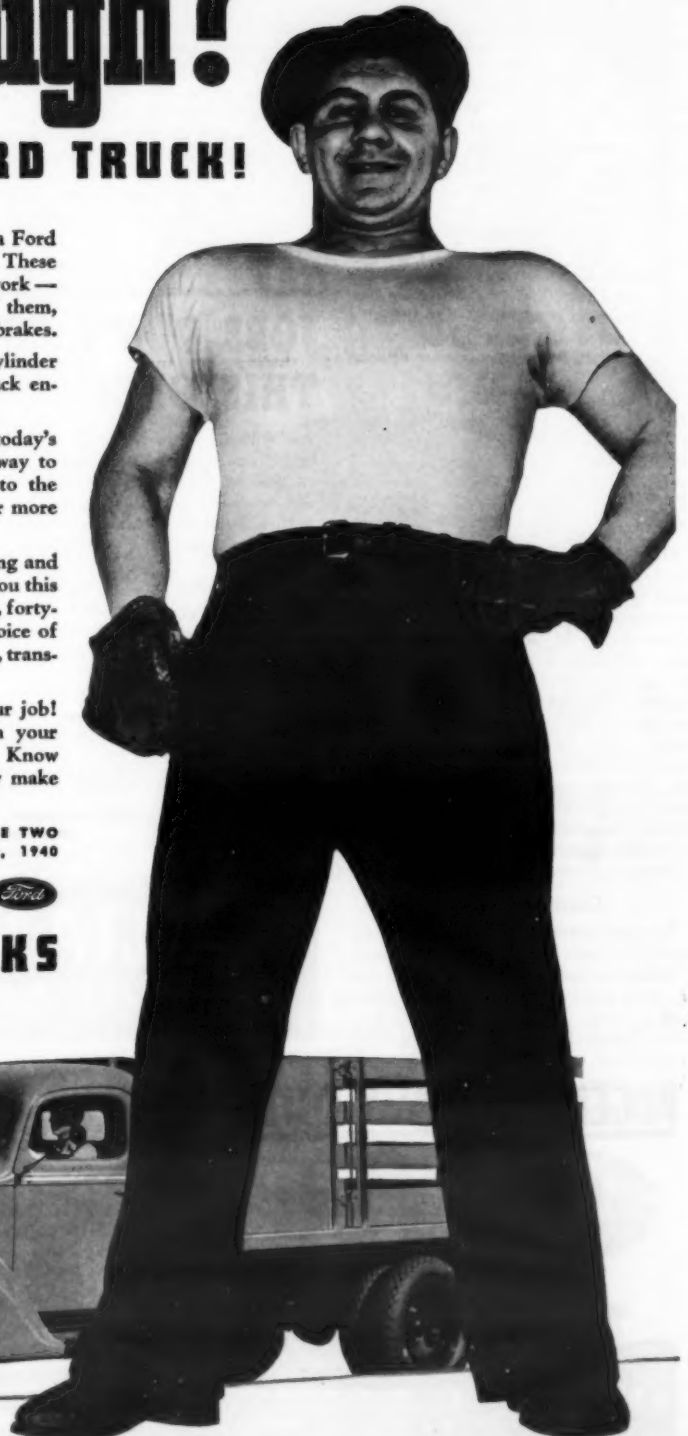
Watch a Ford Truck go to work on your job! Make an actual "on-the-job" test — with your own driver and loads over your own routes. Know the difference Ford quality and economy make before you spend another truck dollar.

VISIT THE NEW FORD EXPOSITIONS AT THE TWO FAIRS, NEW YORK AND SAN FRANCISCO, 1940

• Ford Motor Company, Builders of Ford V-8 and Mercury Cars, Ford Trucks, Commercial Cars, Station Wagons and Transit Buses.



FORD V-8 TRUCKS



CORNETT SLOPER

Bank Sloping Revolutionized!



- Slopes banks rapidly.
- Easily attached to any shovel in an hour's time.
- Will cut any slope that a shovel can dig through.
- Controlled entirely from operator's seat.
- Will cut through sand, gravel, soil, clay and broken rock in one operation.

See your dealer or write for further details

CORNETT SLOPER

107 DeGraw St., Brooklyn, N. Y.



C. & E. M. Photo
Aggregate for the concrete for the retaining walls was stockpiled along the highway and loaded into calibrated trucks. One of the Barber-Greene loaders is shown delivering stone to a Ford truck.

Channel Excavation To Protect Highway

(Continued from page 15)

was hauled from East Deerfield, Mass., and stockpiled at convenient points along the road, then loaded into calibrated trucks from the stockpiles by Barber-Greene loaders. One man remained on the trucks to level the material and to signal the loader operator when to stop the belt. The paver chuted the mixed concrete direct to the forms where it was not vibrated in place. In spite of this, it was unusually free from honeycombing, due to the careful spading and treading in the forms by four to six men. In addition to the paver operator, there were two men handling the cement at the paver, one man at the top of the chute, and two at the bottom. The transit-mix trucks backed to the edge of the bank in the same manner as the paver for delivering concrete to the forms.

The batches for the 6-bag batch of the paver and the 19-bag batch for the transit mixers for the Class C concrete were as follows:

Material	Paver Batch	Transit Batch
Sand	1,644 pounds	5,400 pounds
Stone	2,364 pounds	7,060 pounds
Cement	6 bags	1,780 pounds

With 2 per cent calcium chloride

After the forms were stripped on the day following pouring, the walls were cured for a minimum of seven days by covering with canvas and heating with salamanders. In addition, the mixing water was heated by a large coil and the aggregate was steam heated by a Hodge boiler running at 125-pounds pressure. Then the backfill and surcharge were placed by end-dumping from trucks loaded with channel excavation. For general grading both for the roads over which the trucks hauled the channel excavation and for the top of surcharge material, an Austin-Western 77 Senior motor grader was used.

Grouted Riprap

The specifications required the riprap stone to contain 85 per cent larger than 18 inches in the smallest dimension but the stone used averaged over 1/2 cubic yard in size. This material was taken from channel excavation and end-

dumped from the road by trucks and laid by two Bucyrus-Erie cranes to a minimum depth of 24 inches. The grout for the riprap was chuted direct from the Koehring 27-E paver run along the top of the protected bank. A 2-inch centrifugal pump with a Wisconsin motor took water from the stream to supply the paver throughout the work.

Channel Excavation

Channel excavation was a large item on this job, involving the removal of some 150,000 cubic yards of gravel and boulders up to 300 cubic yards in size. For blockholing the boulders too large to handle with the shovel, one Worthington, one Metalweld and one Sullivan portable compressor with Ingersoll-Rand jackhammers were used.

Two new Bucyrus-Erie 33-B's and a new 37-B, as well as another 1 1/4-yard

Bucyrus-Erie shovel, and a hired Lorain 75 diesel shovel, were used in excavation. This equipment loaded to a fleet of Autocar and Sterling trucks and seven Koehring Dumpsters. The latter were used for hauling the heaviest rock. The contractor worked on channel excavation throughout the winter and up to the first of March when the frost reached a depth of 6 feet and further excavation without blasting was impossible.

The Trail was closed, except to local traffic, throughout this section but the state highway maintenance forces kept the road as clear of snow as possible and heavily sanded to permit continuous heavy hauling of riprap from channel excavation throughout the winter.

Care of Equipment and Men

Because of the very cold weather experienced throughout the winter, it was necessary to furnish protection for all of the equipment. For this purpose the contractor built a four-door, or rather an eight-door, equipment shed, so that equipment could be run in four lanes in one end and out the other end, making it possible to get out any particular piece of equipment with the minimum of maneuvering of other equipment. During the winter Maney hired a house and souvenir stand adjacent to the shed for an office, but as soon as spring came and traffic began to use the Mohawk Trail, he built a substantial shed with the time-keeper's office and grease shed and auto repair shop adjacent, releasing the souvenir stand "The Totem Pole" to its owners. As soon as good weather came, the equipment was allowed to stay outside and the large shed was used partly for cement storage and for overhauling

JOBS DON'T COME TOUGHER THAN THIS ONE!

This Williams 1/2 Yard Multiple Rope Bucket took plenty of punishment on this job—tearing out the massive stone and concrete foundations of the old Baldwin Locomotive Works in Philadelphia. Wm. Geppert, Inc. are the contractors.

The digging power in Williams design and the rugged durability of their welded rolled steel construction make Williams Buckets profit producers for contractors everywhere.



Bulletins describing all types of Williams Buckets sent FREE on request.

THE WELLMAN
ENGINEERING CO.
7012 CENTRAL AVE.
CLEVELAND, OHIO



WILLIAMS Buckets

built by WELLMAN

ROGERS has built HEAVY DUTY TRAILERS exclusively FOR 25 YEARS



This experience assures getting a trailer exactly suited to your needs—designed for strength with lightness—load hauls faster with less power—has a wider self-extendable control all times.

• EXPERIENCE built it •

ROGERS BROTHERS CORPORATION
166 Orchard St., Albion, Pa.

• PERFORMANCE sold it •

equipment under cover. Equipment maintenance was a large item on this job, because of the rough character of the excavation.

For night work during the winter, electric floodlights were used extensively. In the Town of Florida, near Station 340,

(Concluded on next page)

KNOW

HOW TO MAKE YOUR 5-S MIXER DOLLAR GO FARTHER!...



GET YOUR FREE COPY OF THIS NEW BOOK!

Even the most experienced contractor will find a lot of usable information in this book, including details on many important mixer design features which do not meet the eye at first glance. It tells the whole story of Rex design and construction and includes details on: the famous Rex Shimmy Skip; Rex non-diaphragming water tanks; Rex short-arc controls; Rex chain belt drive transmitting power in the "up direction." It completely describes the 1940 2- and 4-wheel Rex 5-S and 7-S Mixers.

DON'T BUY ANY 5-S OR 7-S TILL YOU'VE SEEN THIS BOOK!

It costs no more to be sure that the mixer you're buying has all these cost-cutting features! Just use this book as a check list and compare any other 5-S with the Rex, feature by feature. You'll see how Rex got its reputation for faster, lower cost mixing of higher quality concrete. Address the Chain Belt Company, Dept. M5, 1666 W. Bruce Street, Milwaukee, Wis.

DON'T DELAY—SEND TODAY!

BUY REX AND BE RIGHT!
MIXERS

Change of Address

(Mail to Contractors and Engineers Monthly, 470 4th Ave., New York, today)

From.....
(Old address)

To.....
(New address)

Name.....

Work on Mohawk Trail Prevents Flood Damage

(Continued from preceding page)

at the notorious Dead Man's Curve where there is a vertical drop of 80 feet from the highway to the stream bed, the contractor put in a substantial stairway to save the time and energy of the men in getting from the trucks on the road down to the equipment operating on channel excavation and riprap.

At this point he ran a shovel and Dumpers, which required gasoline at frequent intervals. After trying to handle 50-gallon drums of gasoline down the stairway it was decided that it would be better to run a 1-inch pipeline around the hand-rail. This was done, and the gasoline delivered from the top to a 50-gallon drum at the bottom.

Labor Regulations

Since this work was started on October 19, 1938, less than a month after the hurricane, under an emergency bond issue, there were no labor regulations regarding hours of operation. It was greatly feared that there might be a recurrence of the flood condition, which would have caused even greater damage to the highway with the weakened condition of the banks. The job was completed before the end of August, 1939, which was the contract completion date.

Personnel

The contractor for the heavy retaining walls and riprap along the Cold River in the towns of Charlemont and Florida on the Mohawk Trail was C. J. Maney & Co., Inc., of Somerville, Mass., for whom Michael Taurasi was Superintendent. Maney was awarded the contract on the low bid of \$787,461. For the Massachusetts Department of Public Works, Hugh Corr was Resident Engineer and Frank Soule, Assistant Resident Engineer.

New 1940 Streamline Portable Compressor

The Gardner-Denver Model ABY 85-foot utility compressor is designed for use in the construction field where complete portability is essential. The unit will operate one heavy paving breaker



The Model ABY Utility compressor.

or two of the lighter models, one medium weight jackhammer, or three to four spaders or trench diggers.

The compressor itself is a two-stage water-cooled unit providing 85 cubic feet of air a minute. The water-jacketed compressor cylinders maintain an even temperature, summer or winter, and damage to the cylinder blocks, pistons and rings resulting from cold starting is avoided because the compressor cylinders are warmed up during the warm-up run of the engine. An oversize Twin

Disc clutch permits easy cranking and warm up before the engine takes the compressor load.

The unit is mounted on a roller-bearing two-wheel spring trailer for high-speed towing from job to job, with conveniently arranged stabilizing legs to steady the machine and prevent creeping when in operation. On skids, this compressor is compact enough for mounting crosswise in the body of a truck, just behind the cab, leaving the rest of the truck body free for other equipment.

Bulletin ABY describing and illustrating this portable utility compressor may be secured by those interested direct from the Gardner-Denver Co., Quincy, Ill.

Diesel Tractor Booklet

The complete line of International diesel TracTracTors is described and illustrated in a new 1940 catalog of the International Harvester Co., Inc., 180 No. Michigan Ave., Chicago, Ill.

This booklet takes diesel TracTracTors apart, showing by text and photograph the various parts, their features, and "what makes them work". In addition, there are a number of job photos, illustrating the wide field of service rendered by TracTracTors.

Copies of this 1940 TracTracTor catalog may be secured by contractors and state and county highway engineers direct from the manufacturer.

Aeroil OIL BURNING CONTRACTORS' EQUIPMENT

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GOHI PIPE CORRUGATED

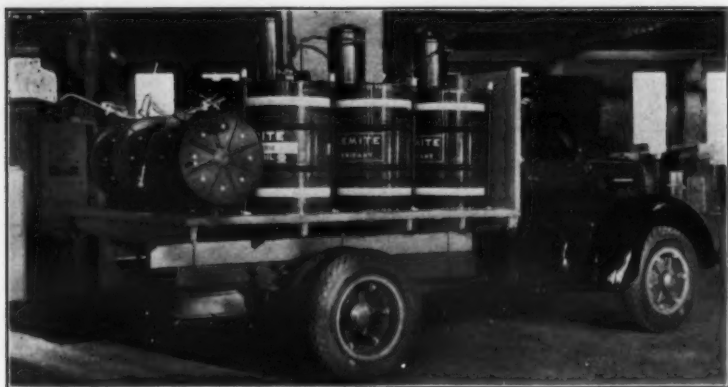
Corrugated Pipe . . . Part Circle Pipe . . . Perforated Pipe . . . Connecting Bands . . . Shapes and Fittings . . . Flumes . . . Erosion Ditch Checks . . . Deck Drains.

Every day the endorsement of GOHI Corrugated Pipe becomes more widespread and increasingly enthusiastic as the passing years roll up their accumulated evidence of the outstanding performance of GOHI . . . the longest-lived, low cost ferrous metal for drainage structures.

GOHI Pure Iron-Copper Alloy is a highly refined pure iron-copper alloy of uniform quality and homogeneous structure, produced by a basic open hearth process under the most exacting metallurgical control. Abrasion and corrosion resisting GOHI Corrugated Pipe, therefore, is the one logical choice for any culvert installation . . . demonstrating its matchless ability to deliver trouble-free service where extreme destructive conditions are encountered.

New England Bolt Co. Everett, Mass.
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Bancroft & Martin Rolling Mills Co., S. Port'd, Me.
Denver Steel & Iron Works Co. Denver, Colo.
The Lane Pipe Corporation Bath, N. Y.
Dixie Culvert Mfg. Co. Little Rock, Ark.
St. Paul Corrugating Co. St. Paul, Minn.
The Newport Culvert Co. Newport, Ky.

GOHI CULVERT MANUFACTURERS, INC., . . . NEWPORT, KY.



The Alemite portable service station mounted on an International truck.

Power Lubrication Right on the Job

The Alemite portable service station is designed to provide proper power lubrication for fleets of tractors and other road building and contractors' equipment right on the job, with a minimum of "time out" for greasing.

This portable service station, designed for mounting on a truck or semi-trailer, consists of a high-pressure barrel pump for high-pressure bearing lubrication, complete with hose; a low-pressure barrel pump for filling transmission and final drive, complete with hose; a low-pressure barrel pump for filling crankcases, with hose; an oil dispenser, complete with hose; a two-stage air compressor and necessary accessory equipment, powered by a 2-hp vertical single-cylinder 4-cycle air-cooled engine; and a Flex-Tip air blow gun. Four reels, mounted conveniently at the back of the truck, carry the hose for the three types of lubricants and the air hose for tires and for air-cleaning. Each of the four hose is equipped with the proper type of gun for each purpose. The air compressor is mounted on one side of the truck, leaving ample space for several drums of lubricants on the other side.

Literature describing the Alemite portable service station for modern field maintenance of equipment, with illustrations showing these service stations in use on the job, may be secured by interested contractors and engineers direct from the Alemite Division, Stewart-Warner Corp., 1850 Diversey Parkway, Chicago, Ill.

Two New Steel Posts For Road Guard Rail

The Union Metal Mfg. Co., Canton, Ohio, manufacturer of lighting standards, Monotube fluted pile forms for concrete piles, and corrugated steel sheet piling, has recently announced two new steel guard-rail posts.

One of the two styles of posts is triangular in shape, 6½ inches from front to back and approximately 7 inches across the back, with a 1¼-inch flattened area at the front for fastening the cable brackets, and a post cap 3 inches high. The standard posts are 6 feet long, of 7-gage steel, although the length and gage of steel may be varied to suit individual requirements.

The other style of post, also 6 feet long, is of fluted steel, approximately 8½ inches in diameter, with a 1¼-inch welded tube extending through the post about 6 inches from the top to accommodate a through bolt for the guard rail attachments. These posts have 16 flutes and are made of 11-gage steel, although the length of the posts and the gage of the steel may be varied to suit conditions.

The manufacturer states that due to the special shapes, greater strength and life may be expected from these posts. Another advantage is that in most types of road fills a steel post can be driven easily by a small portable driving machine, thus reducing the amount of

equipment and time required for driving the posts.

It is also stated that the round fluted post has certain advantages over the triangular-shaped posts, the first being that a round post will resist a blow or pressure from any direction, as well as resist torsion loads better. Another is that the fluted post is approximately twice as strong as the triangular type under impact tests, due to the fact that the flutes provide a means of gripping the ground, thus increasing the resistance of the post to impact.

Further details on these two new steel guard-rail posts may be secured by interested state and county highway engineers direct from the manufacturer.

New Men at Cummins

Two new appointments have recently been made by the Cummins Engine Co.,

Columbus, Ind., to its sales staff. Robert W. Stratton, formerly a service manager and district sales manager for a well-known tractor and bulldozer manufacturer, has been appointed Regional Sales Manager for the northern part of Ohio, with headquarters at Cleveland.

Norman E. Palmer, another addition to the Cummins organization, will be among the group which David Buttles, Sales Manager of Cummins Engine Co., will take to New York City to establish a factory sales office. This new office in New York where Mr. Palmer will have his headquarters will not be a part of the local sales and service office, but will be available in establishing a closer relationship between the factory and its many eastern outlets.

Multiple Traction Trucks

Boost Contractors' Service

A service which Marmon-Herrington Corp., Indianapolis, Ind., renders to contractors in all of the heavy construction fields has been to eliminate awkward, unwieldy traction vehicles and make it possible for a contractor to use any Ford truck he wishes with an all-wheel drive furnished by Marmon-Herrington.

Today there are thirty-three different sizes and models of Marmon-Herrington heavy-duty all-wheel-drive vehicles available in 4-wheel and 6-wheel drive, powered with gasoline and diesel engines and with gross-load capacities ranging from 10,200 to 70,000 pounds. In the group of smaller all-wheel-drive vehicles there is the standard Ford truck converted to all-wheel drive in the Marmon-Herrington plant. Today it is pos-



Other Lansing Equipment for Contractors includes Scrapers, Mortar Boxes, Concrete Chutes, Hoists, Wheelbarrows, etc. A Line with a wide range of uses—always known for its stability. A Line with a reputation of nearly six decades of successful manufacturing and pioneering.

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Fast, compact, easy handling. Its overall length is only 57" and entire width 68" and 55" high. The Lansing 3½ E. D. Mixer has a convenient shoveling height of only 42½". A 31-inch drum, sturdy 1½" axles and 26" wheels with pneumatic tires. Weighs 960 lbs. Learn more about this economical, dependable new mixer.

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Heavy Duty

TRAILERS



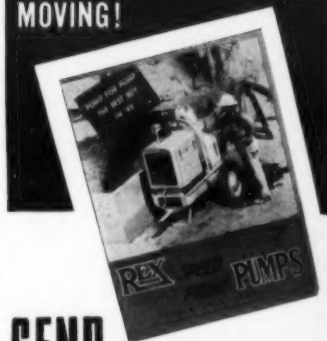
The most complete line on the market. Capacities, five to two hundred tons. Four to sixteen wheels. Two to eight axles. They are built to take the heaviest loads safely, and with the least damage to road beds. Write today. Just tell us what you have to move.

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WHO WANT THE FACTS
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FACT NO. 1: Only Rex Speed Prime pumps offer you the "air-peeling" advantages of the famous Rex Z-Metal Peeler!

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Fast prime and the ability to prevent costly recirculation of air mean more gallons per hour, at lower cost per gallon! It's worth investigating, isn't it? Then send today for the free book pictured above which will give you the complete story on Rex Speed Prime pump's design and performance. Address Chain Belt Company, Dept. P3, 1666 West Bruce Street, Milwaukee, Wisconsin. Ask for Bulletin No. 365.

BUY **REX** AND BE RIGHT!
PUMPS

Santee-Cooper

(Continued from page 13)

Spillway Dam, 3,400 feet long, located almost entirely on a peninsula formed by a loop of the Santee River, will be a low concrete slab and buttress structure, protected by a downstream reinforced-concrete apron approximately 100 feet wide. This dam will contain sixty-two 14 x 50-foot Tainter gates.

The South Dam will be about 2.7 miles long, of which some 10,700 feet in two sections will be constructed of rolled earth fill approximately 30 feet high. Also about 3,600 feet in two sections will be built of uncompacted dumped fill about 15 feet high.

Approximate principal construction quantities for Santee Dam are as follows:

Clearing	1,000 acres
Strippling	1,870,000 cu. yds.
Spillway excavation	710,000 cu. yds.
Concrete	122,000 cu. yds.
Steel sheet piling	223,000 sq. ft.
Reinforcing steel	7,900 tons
Pumped sand fill	8,500,000 cu. yds.
Roller and dumped earth fill	750,000 cu. yds.
Tainter gates and misc. steel	1,800 tons
Pumping	22,000 acre feet
River closure	Lump sum

Pinopolis Dam

The project at Pinopolis, consisting of the dam, lock and power plant, is divided into two sections. Section 1 contains the lock structure and embedded metal work; the power plant substructure including the east abutment and embedded metal work; the superstructure steel frame; installation of the power plant gates, cranes and turbines; the west earth dam and dike; and the entrance road and railroad. Section 2 contains the east earth dam.

Approximate principal construction quantities for Pinopolis Dam, lock and power plant are as follows:

Clearing	394 acres
Foundation excavation, common	280,000 cu. yds.
Foundation excavation, limestone	110,000 cu. yds.
Creek diversion	Lump sum
Strippling	410,000 cu. yds.
Borrow for rolled fill dam	2,230,000 cu. yds.
Rolling and finishing earth fill	2,230,000 cu. yds.
Earth dike embankment	50,000 cu. yds.
Concrete various classes	196,000 cu. yds.
Reinforcing steel	3,600 tons
Installing structural steel gates, etc.	1,800 tons
Installing turbines	6
Furnishing and installing metal guides, etc.	230 tons

Clearing

The sites of both Pinopolis and Santee reservoirs are being cleared by WPA labor, \$6,000,000 having been set aside for this work.

These reservoir areas contain much virgin swamp land covered with jungle vegetation, as well as many fine old plantations over 200 years old. One swamp in the Santee reservoir, 6 miles square, contains one of the last and finest stands of virgin cypress in the country, millions of board feet of which will have to be cut and marketed. This swamp in many places has never been penetrated by man, except possibly an occasional native hunter or fisherman.

These virgin swamps are alive with wild life from alligators to deer and migratory birds, and the clearing of them has been bitterly fought by natives and wild-life lovers. In addition, many controversies and much hard feeling have arisen due to the plan to inundate old plantations and family graves, rich in sentiment and history.

Cost of the Project

Santee Dam is estimated to cost \$5,000,000 and bids for its construction were opened August 29, 1939. East Pinopolis Dam is under contract to be constructed for \$138,670, and the contract for West Pinopolis Dam, lock and power plant was awarded for \$4,172,380.50. The clearing is estimated to cost \$6,000,000, to be done by WPA labor.

The total estimated cost of the entire project is between \$40,000,000 and \$50,000,000 and will probably exceed that figure before completion.

Personnel

The Santee-Cooper project is being constructed under a loan and grant from the Public Works Administration, with Kenneth Markwell, Project Engineer and J. Henry Moore, Assistant Project Engineer. It is owned by the South Carolina Public Service Authority, Tom B. Pearce, Chairman, R. M. Cooper, General Manager, and F. R. Sweeny, Chief Engineer.

The engineering design and supervision of construction is being done under contract by the Harza Engineering Co. of Chicago, L. F. Harza, President, and C. E. Wattles, Construction Engineer.

East Pinopolis Dam is being constructed by the W. C. Shepherd Co. of Atlanta, Georgia; W. C. Shepherd, Owner, and A. L. Shepherd, Superintendent. West Pinopolis Dam, lock and power plant is being constructed by Central Engineering Co. of Davenport, Iowa, under the direction of Otto G. Novis, Vice-President, F. S. Fieweger, Chief Engineer, and A. E. Cossens, General Superintendent.

The Central Engineering Co. has sublet the excavation and earth work on west Pinopolis Dam to Sammons-Robertson Co. of Huntington, West Virginia, D. L. Wiltsee, Project Engineer, Frank B. Daniels, Superintendent, and W. T. Smith, Assistant Superintendent.

New Pictorial Bulletin

Tells Black Topper Story

An unusual piece of manufacturers' literature, entitled "Foto-Facts" and revealing pictorially the features of the 1940 Etnyre Black Topper bituminous distributor, has recently been issued by E. D. Etnyre & Co., Oregon, Ill. Included in these features are the no-drip turn-up folding and full length circulating type spray bar, the Vacu-Flo spray bar cleaning system, slotted non-clogging triple-lap nozzles, compact circulating system, positive displacement pump, simple safe controls, heavy-duty double-sealed tank, and a choice of three engines, a Ford V-8 front drive, a LeRoi front drive or a LeRoi rear drive.

Copies of "Foto-Facts" may be secured by readers of CONTRACTORS AND ENGINEERS MONTHLY free on request to E. D. Etnyre & Co., or from this magazine.

Arc Welding Plays Part

In Erection of Hospital

The new 22-story building being erected at the Medical Center, Jersey City, N. J., contains approximately 2,200 tons of structural steel and has been completely field-welded. The

structure contains approximately 18,000 feet of 3/4-inch equivalent bead, and part of the wind-bracing connections were as heavy as 7/8-inch butt welds.

Essex Erectors, Inc., is erecting and field welding all the structural steel, using Hobart arc welding equipment powered by gasoline engines.

a Continental Engine for "Humdinger" Power



EAST SIDE, WEST SIDE, ALL AROUND THE TOWN...
YOU'LL FIND HUMDINGER PUMPS
WITH CONTINENTAL RED SEAL ENGINES



The well known and widely used "Humdinger" pumps are manufactured by Ralph B. Carter Company, New York City.

The photograph shows practical application of the latest type 6" Humdinger Self-priming Centrifugal Pump in operation at 34th St. and 12th Ave., New York City, on a contract de-watering job of the F. P. S. Construction Company. The power unit is a Red Seal model PF-209.

Red Seal Power is always ready to go to work for you with dependable performance and economy and you will find it profitable to utilize Continental Cooperative Engineering Service by making Continental your source of supply.

Continental Motors Corporation
MUSKEGON, MICHIGAN

THE SIMPLICITY MIXER — Has These Advantages!

- Double "Figure-eight" mixing action. Faster—more thorough mixing.
- Full size mixer box—ample volume below shafts—SKF anti-friction bearings—Requiring less power than other mixers of equal capacity.
- Two large dump doors (with manganese liner plates)—Rapid dumping and complete emptying.
- For—Better Production—Better Mixtures—Longer Mixer Life—Greater Dependability—and Lower Cost, the Simplicity Mixer is the last word.



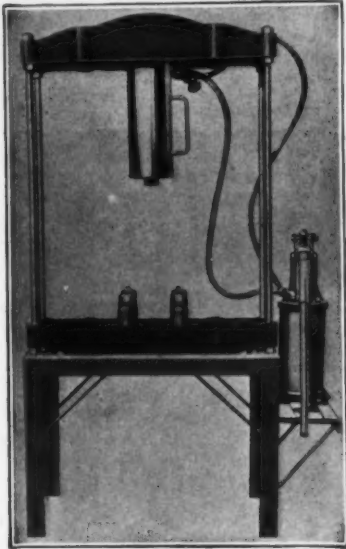
The Simplicity Plant Is More Portable

Hinged tubular columns and hinged elevator bases for erection the simplest way. Designed for separation into the most compact and easily handled units, portable by truck and trailer. Organized dismantling and erection make the Simplicity Asphalt Plant more portable than any plant of equal capacity. Capacities—from 25 to 200 tons per hour.

WRITE FOR DETAILS.
NO OBLIGATION.
NO ANNOYANCE.

THE SIMPLICITY SYSTEM COMPANY
CHATTANOOGA, TENNESSEE

D E P E N D A B L E



The Rodgers portable hydraulic press.

Hydraulic Presses For Truck Repairs

Most state highway department district garages and county garages need to be equipped with an hydraulic press for work on shovel gears, spiders, sprockets, swing shaft assemblies, crowd shaft assemblies, shipper shaft and track mechanism as well as on motor trucks. The Rodgers Universal hydraulic press is designed to be used in any place and in any position where pulling, pressing or lifting power is needed. It is a portable unit and can be carried out on to the job and assembled around the work if necessary. It was originally designed for contractors to use in repairing breakdowns as well as for general overhauling of machinery on the job or in the shop.

The frame head weighs 147 pounds and the base 110 pounds, with the rods weighing 54 pounds, the 4-speed pump 73 pounds and the cylinder 75 pounds. On low speed one man can produce more than 10,000-pounds pressure per square inch, while on high speed the ram moves about 1/8-inch per stroke of the pump handle. The pump contains an oil reservoir for the pump cylinder, using S. A. E. No. 20 oil in summer and No. 10-W in winter. About 5 quarts of oil is required. The ram or press cylinder has a pressure capacity of more than 100 tons. A simple valve release returns the ram to its original position. The frame rods are 1 x 48 inches and there are four nuts for each of the four rods. A back plate is furnished with the four rods to attach the cylinder to the top of the frame head. There are 5 feet each of high-pressure and oil-return hose.

Complete information regarding the Rodgers hydraulic press, including its numerous uses and the methods of applying it to different types of work will be found in Bulletin 2139, which will be sent immediately to readers of this magazine upon application to Rodgers Hydraulic Inc., 721 Laurel Ave., Minneapolis, Minn.

New Excavator

The new Type 10 excavator in the 3/8 to 1/2-yard class recently announced by the Osgood Co., Marion, Ohio, is claimed to have the stability and power of a larger machine with the speed and mobility of a lighter unit. It is convertible in the field to all classes of service.

The deck for the machinery is a sturdy one-piece steel casting, and all machinery is mounted on machined pads. The engine and countershaft are mounted on a cast-iron safety fuel tank. Power is transmitted to the countershaft through a silent chain drive, straight to the dipper, through gears running in oil baths. The swing and travel, crowd and retract gears are fully enclosed and run in oil, and are equipped with multiple-disc-type clutches. The drum shaft, which is anti-friction-bearing mounted, is driven from the countershaft. Clutches are set by the Osgood Servo Mechanism for swift, smooth and quiet operation. The heavy-duty crawler construction is of unit steel castings in side frames and base, supported by strong cross members.

The boom on the Type 10 is all steel, reinforced and welded into a strong unit. The crowding chain runs up the center of the boom, is self-adjusting to all boom angles, and is kept at the right tension by a simple chain tightener. Manganese steel racking is welded to a strong steel shell to form the dipper handle. A vacuum dipper trip is used. Big boom point sheaves give extra wear to the wire rope.

Catalog No. 3916 covering the new Type 10 excavator and complete specifications may be secured by those interested direct from the manufacturer or from this magazine.

Chevrolets Changed To All-Wheel Drive

The Asam-Chevrolet patented front-axle assembly, made by the Asam Motor Co., Detroit, Mich., is designed for the quick and easy conversion of Chevrolet trucks to all-wheel-drive units for heavy-duty service.

Features of the unit include the fully gear-driven axle with no universal joints, a built-in two-speed driving range providing eight speeds forward and two in reverse, no declutching of the

front-axle drive necessary at any time, positive four-wheel drive, and quick and easy installation by any Chevrolet dealer.

A detailed illustrated description of this front-axle assembly is contained in a four-page folder, copies of which may be secured by interested contractors and state and county highway engineers direct from the manufacturer by mentioning this magazine.

New Coffing Sales Manager

Announcement has been made by the Coffing Hoist Co., Danville, Ill., of the appointment of Harry N. Hayes as General Sales Manager. Mr. Hayes has been with this company for a number of years, during which time he has been District Sales Manager in various territories so that he is well known in the field.

WAREHOUSES

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Galion stone spreader (right). Two sizes: 8 and 9 feet in width. Adjustable for laying material up to 12-inch depth.

**SPREAD
with
GALION**



Galion builds a complete line of spreaders for road building and maintenance work. These lay such material as stone, chips, slag, asphalt and concrete to desired depth. Also road widening spreaders for spreading material at side of road.

Galion spreaders are light, self-contained units easily handled and easily moved from job to job. They are quickly attached to any type of dump body truck and require no power for operation. All types have accurate adjustments. Send for our spreader catalog.



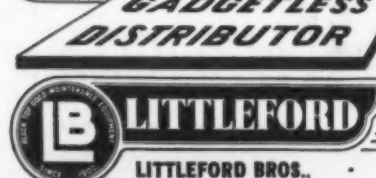
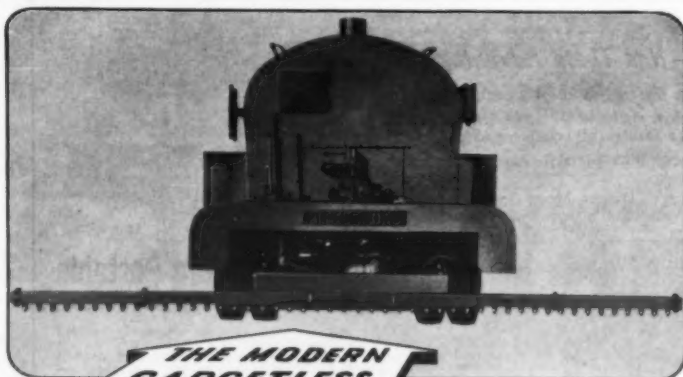
Galion tandem roller—furnished in three sizes from 5 to 14 tons in weight. Gasoline or diesel engine. Also 3-wheel and portable rollers.

The Galion Iron Works & Mfg. Co.

Main Office and Works: Galion, Ohio
Export Division: Columbus, Ohio



A Galion chip spreader is shown at the left. This type gives perfect performance on chip-spread operations in road maintenance, repair and in new road building. Spreads to a uniform depth of 10 feet with clean, straight edges. Has adjustable steering hitch.



Here's the New Spray Master Pressure Distributor, the Distributor that combines Simplicity, Economy, and Efficiency in Operation. It has front mounted engine with pump in rear—air cooled fuel liner and Hydraulic Ground Clearance system. Full Circulating Spray Bars up to 24' can be used.

LITTLEFORD BROS., 485 E. Pearl St., CINCINNATI, OHIO

Mass. Experiments With Sandy Bases

(Continued from page 1)

Two Contracts Awarded

Although the delay in the setting of the base was somewhat discouraging, further experiments were tried with another grade of asphalt, RC-1. Two contracts, one in Chatham and one Orleans, both on Cape Cod, were selected and the projects were advertised for bids. Due to the existence of a large mixing plant within a reasonable distance from these projects, it was decided to request alternate bids for (1) stabilized mixed-in-place base and (2) stabilized plant-mix.

On the Chatham project, a further experiment was tried in that the stabilized base was used as a wearing surface, as the road was a connecting link between the state highway and a local beach and was not subject to heavy through traffic.

The bid on the Orleans project was \$4.50 per cubic yard for 750 cubic yards of plant-mix stabilized base material, laid as a 4-inch compacted base for a foundation of a 1½-inch bituminous-concrete Type I top. The area was 6,600 square yards, giving an estimated cost of 50 cents per square yard.

The mixed-in-place base was bid at 38 cents per square yard for 6,600 square yards, and 14 cents per gallon for 16,000 gallons of RC-1 bituminous material, giving an estimated cost of 72 cents per square yard in place.

The plant-mix job cost was \$3,262.50 and the mixed-in-place job \$4,748.00, so the contract was awarded for the plant-mix stabilized base.

On the Chatham contract the plant-mix stabilized base was bid at \$4.50 per 1,000 cubic yards of material, or \$4,500, and \$254.75 for a seal coat of ¼-gallon per square yard of RC-1, or a total of \$4,754.75 which, on a basis of 9,030 square yards, would give a cost of 53 cents per square yard. The mixed-in-place bids were 40 cents per square yard for 9,030 square yards of surface, or \$3,612, and \$3,164 for 22,600 gallons of RC-1 bituminous material, giving a total of \$6,776. On the basis of 9,030 square yards, this gave a cost of 75 cents per square yard, with the plant-mix the low figure. The contracts were awarded late in October, 1938, and no work was started until May, 1939.

Specifications for Plant-Mix Surface

Since this type of stabilized surface was intended for use with local clay and sand aggregate, mixed with a required quantity of bitumen in the plant and spread ready mixed on the prepared subgrade, a screen specification with the moisture and bitumen content as follows was set up.

Passing Sq. Opening Sieve	Retained Sq. Opening Sieve	Min.	Max.
1 inch	¾ inch	5	15
¾ inch	10 mesh	8	18
10 mesh	40 mesh	40	70
40 mesh	80 mesh	4	20
80 mesh	200 mesh	3	15
200	(—)	8	12
Moisture Bitumen		2	4 5.25

Methods of Construction

The plant-mix unit was required to be equipped with fins to stir the clay and sand aggregates separately, with an adjustable automatic feeding device for introducing the material into the mixer and with a weigh back for delivering the mixed material by weight with the asphalt to the mixer. The contractor was required to use trucks with dump bodies to permit rapid unloading, and equipped with dual pneumatic tires. Rolling was to be done with 3-wheel rollers not less than 5 tons, with 10 and 12-ton rollers as required in order to obtain a final compaction.

The specifications stated that the clay

and sand aggregate, containing from 2 to 4 per cent moisture, were to be mixed in the plant with the bitumen at the specified weight and the bituminous mixture was to be spread and compacted in layers not over 2 inches in thickness. Each course was to be rolled longitudinally, beginning at the edges and continuing toward the center. When the compacted mixture supported the roller without excessive marking, the surface was then to be rolled diagonally until all marks left by the equipment had been eliminated.

On May 29 the first loads of mix arrived on the Chatham job, and apparently showed no tendency to set up enough to support a roller. After some delay, however, a 10-ton roller was tried out but the material crumbled and pushed, and the rolling operation had to be suspended. Prevost Hubbard of The Asphalt Institute visited the job at that time and recommended a change in the asphalt content from 5.25 to 7 per cent. Several loads of mix with increased asphalt were delivered, but showed no

improvement in the setting over the mix with the lower asphalt content and the mixing time was then lengthened at the plant in order to eliminate volatiles.

As the contractor had ordered and received a complete shipment of RC-1 to complete both projects, it was out of the question to experiment with a different type of asphalt. He did, however, agree to secure one truck load of RC-3 at the request of the engineer, as this bituminous material contains 15 per cent less volatile than the RC-1. The mix with the RC-3 bitumen provided a surface which was able to hold up a 10-ton roller shortly after the material was spread, without crumbling or pushing the mix.

After the 10-ton roller had been removed on the first mix received on the job, a 5-ton truck was substituted, and the results indicated that the rolling would be successful with rubber-tire wheels or a light sidewalk roller. Thereafter, a 3-ton tandem roller was used with satisfactory results. Within two days the 5-ton trucks, loaded with the mix, were

allowed to run over the surface which had been compacted with the 3-ton roller and no injurious effect resulted.

Conclusions and Personnel

The conclusions drawn from this experiment were:

1. That a plant-mix stabilized base requires light rolling.
2. RC-3 bitumen seems preferable to RC-1 for plant-mix.
3. RC-1 reacts favorably on a mixed-in-place base due to the various mixing operations on the ground which allow the volatiles to evaporate.

Both jobs were constructed by M. F. Roach & Sons, Inc., of East Bridgewater, Mass. The Resident Engineer for the State of Massachusetts Department of Public Works was Fred M. Wright, and the work was under the supervision of William C. Tuttle, Senior Assistant Engineer, and Bertram French, Assistant Engineer. John Griffin, District Materials Engineer, supervised mixing and testing operations at the plant.

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ROAD FORMS
every time!

They reduce
my form setting
costs 40%.

M'm—that's a
worth while
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Aligning **ROAD FORMS**

BLAW-KNOX DIVISION
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"Yes—we get both wet
and dry batches from this
BLAW-KNOX CENTRAL
MIXING PLANT.

It gives us both mixed
concrete and dry batches
for compartment trucks
or truck mixers."

No matter how varied and involved the concrete requirements
on your job might be—Blaw-Knox will design a Central Mixing
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Hydraulic Scoops—

Choose Hauling Unit Most Suited to Work

(Continued from page 22)

unit or by several of these units. The management problems involved differ widely.

The first type of outfit is based on a power shovel or an elevating grader as the digging tool, uses tractor-drawn wagons or trucks for hauling, and bulldozers or blades for spreading the material as it is dumped somewhere near its final position. The second type of outfit uses dredges, draglines, bulldozers and tractor-drawn scrapers. Of these, the tractor-drawn scrapers are definitely the most important and are rapidly becoming the most generally used tool in the highway grading field, if they have not already reached this position.

The outstanding difference between outfits of these two types is that where the first type is used, efficiency in the management of production depends on maintaining a correct balance between the output of the digging unit and the amount the hauling units can move. This does not sound like much of a problem, but in practice it has been found to present one that is definitely complex. One rarely sees either a shovel job or an elevating grader job on which there was a really efficient balance between the tooling of these two operations. The lack of balance ordinarily arises from a failure to provide a sufficient number of hauling units for the work on hand.

The attainment of full efficiency in handling any sort of construction work requires a definite recognition of two facts which are fundamental. The first is that equipment should be used to its full capacity. The second is that the tooling of all successive processes must be in balance. When the tooling of some one process is inadequate, it follows that the output of other processes is reduced to the output of the undertooled process.

Take a power shovel outfit as an illustration, and assume a shovel that in good common excavation picks up $1\frac{1}{4}$ yards at a bite. This shovel, in the hands of a good operator, can dig and place on the wagons no less than 180 dipperfuls or 225 yards an hour. The overall operating cost of such a shovel would be in the neighborhood of \$60 a day. Working at capacity, this shovel will then dig and load material for less than 3.5 cents per cubic yard. But if, because of an inadequate supply of trucks this shovel can turn out only 100 dipperfuls or 125 yards an hour, the cost of digging and loading rises to 6 cents per cubic yard handled.

On the other hand, if the contractor provides more hauling units than the shovel can load, the result is that hauling costs are increased. Thus, if six tractor-drawn wagons are in use when only five are needed, it is apparent that hauling costs are six-fifths of what they should be.

Outfit Capacity

More attention should be given to having an outfit of the right capacity for output. There is little difference in the unit cost at which a $\frac{3}{4}$ -yard shovel, a $1\frac{1}{4}$ -yard shovel, and a $2\frac{1}{2}$ -yard shovel will dig and load material, all of them being in the hands of good operators and all being served by an adequate supply of hauling units. This difference is not so great but that the small machine, if kept at work, will make more money than the large machine will if it is idle a good part of the time. The outfit or outfits the contractor selects should fit the jobs he usually has, not the big jobs he secures only once in awhile. It is much more profitable to have a small outfit he can keep busy than to have a big outfit which the amount of work available will permit him to operate only part of the time.

Working Capital

Buying equipment ties up capital and reduces the working funds the contractor needs in handling his operations. A \$50,000 outfit will move a great deal more dirt than a \$25,000 outfit, but having it ties up 25,000 extra dollars. If the outfit can be kept busy, well and good, but if the amount of work that is available is only sufficient normally to keep the \$25,000 outfit busy, that extra \$25,000 is of much greater value as working capital than it is ever likely to be in the form of machinery which will spend much of its time in the yard.

Harmonizing Digging and Hauling

Whether the outfit is of the right size, too large or too small, the fact remains that while it is working, its efficient operation continues to demand that the

capacities of the digging unit and the hauling units be kept in harmony. This sounds simple enough, but in the highway grading field, where either power shovels or elevating graders are in use, it is by no means as simple as it sounds. This is because the haul distance varies widely from day to day, often from hour to hour. It seems an easy matter to determine the speed at which a truck-track-type-wagon unit moves. The time required, per load hauled, for such repetitive operations as dumping the load, turning on the dump, turning at the shovel, or at the elevating grader, and taking on the load may be readily determined. These operations consume such a uniform amount of time that on any job they become what all of us know as a constant. The result is that knowing the speed traveled and this constant, the round trip time per load can be worked out very easily and from it the number of units that should be in operation for any haul distance.

Calculations made on this basis would prove quite adequate were it not for one thing. Complete efficiency in handling earth work must take into account the fact that equipment involves investment and investments should be kept at work. Accordingly, it is undesirable to lay up any equipment if it can be usefully employed. Another matter of consequence is that good operators cannot be picked up and discharged at will. They will not work where they are handled in this way. For these reasons contractors find it advantageous, if not absolutely necessary, to study the amount of haul a job involves, what the maximum hauls are, what the average hauls are, etc., and on the basis of this information to determine that six tractor-drawn wagons or

fifteen $1\frac{1}{2}$ -ton trucks, or some other specific number of hauling units of some definite type, will be sent out to serve the shovel. Thereafter the problem is not "How many wagons are to be sent out today?" but "What haul distances

(Concluded on next page)

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ELKHART INDIANA

COUNTY OF YOLO
Woodland, California

March 7, 1940.

Dear Sir:

Attn: Mr. George Stowers

During the recent flood conditions in Yolo County your Michigan Truck Shovel played a very important part in protecting the town of Knights Landing from flood waters of the Sacramento River.

On the evening of February 25th the water reached the level of the levee and it was necessary to seek the levee for about 1000 feet. At this time the only means of loading and hauling dirt was by use of hand shovels — our Michigan Shovel being 25 miles away. At 11:00 O'clock I telephoned Mr. Stowers, Foreman in Road District #2 to bring the shovel to Knights Landing immediately. It was necessary for Mr. Stowers to get his operator and drive 20 miles to the point where the shovel was located.

At 2:00 A.M. just two hours after our call the Michigan was in operation and the first load of dirt was dumped on the levee.

Conditions were very critical at this time and if the shovel had not arrived when it did considerable flood damage to Knights Landing would have resulted.

The portability of this unit was well demonstrated on this occasion, and we feel that this equipment was then well for itself in this emergency, when time meant

Very truly yours,

Coyles

Good Job Management Reduces Dirt Costs

(Continued from preceding page)

can we assign to the various wagons that will keep them and the shovel busy too?"

On the correctness of the day-to-day answer to this question much of the profit or loss in today's grading operations depends. The answer is not a simple one to find. Assume that you are building a fill for which material is being taken from a cut—the ordinary situation on a highway job. It is 1,000 feet from the shovel to the balance point in the fill. The shovel can dig three loads a minute. Each truck takes two dipper loads, an average of $2\frac{1}{2}$ cubic yards. There are fifteen trucks. Could you take the plans for a highway and work out, day after day, a distribution of the deliveries from these trucks which would keep them all profitably busy and at the same time show the least loss of time at the shovel? It is not a simple matter, nor is it one that often is attempted other than on the basis of the superintendent's judgment and experience. But it is one that can be done and in the proper doing of which lies a good deal of profit.

Job Management

If the preparation for efficient construction is complete, job management can and, with responsible oversight, will be made to produce efficiently. Without this preparation, the best job management will secure other than moderately satisfactory results only if conditions are accidentally favorable. If the preparation for efficiency is complete, success is by no means an accident and it should be at least a near certainty.

No matter how well the preparatory work has been done, such matters as the selection of a competent superintendent and competent operators cannot be overlooked. Neither can the matter of having enough men on the work without having too many, of preserving discipline, of requiring those who are employed to work while they are at work, to put in the proper amount of time and honestly to endeavor to accomplish what the plans for efficiency have made it possible for them to accomplish. This is not a day in which good results come from driving men. It is a day in which good results come only from good planning, but it would be quite improper to leave the thought that a good plan insures a good result. No matter how good the plan is it must still be executed. This requires not much of drive but a great deal of management. Given a good plan and good management of its execution, the objective, full efficiency in the attainment of the desired results, can be predicted with confidence.

Single Unit Outfits

The tractor-drawn scraper is the most widely used single-unit piece of grading equipment. It is an efficient tool and I am convinced that its use will increase. There are several reasons for this. One of these is that while it is primarily a hauling unit and as such involves about

the same investment as a tractor-wagon unit of similar carrying capacity, it is so efficient as a digging unit that it takes less time, in good common excavation, to pick up a load itself than it takes even a fairly large shovel to load a tractor-wagon unit of the same capacity. It distributes its load so well and so evenly that in the hands of a skillful operator the use of a bulldozer is unnecessary, and it is so heavy that when material is put down in small lifts there is a much reduced need for rolling. A fleet of these tractor-drawn scrapers will therefore handle about as much material as the same number of tractor-wagon units and do this without the cost of owning or of operating a shovel, usually without the bulldozer and on a great deal of work without the roller. The saving in investment and in operating cost provided by the use of these units is therefore of such consequence as definitely to encourage their use whenever the material to be moved is such that they can handle it.

As important as this aspect of their operation is, it is in my judgment of less consequence as an incentive for their use than the ease with which their use can be managed efficiently. A good deal of emphasis has been laid on the fact that really efficient operation can be maintained on jobs on which power shovels and elevating graders are used only as the tooling of successive operations is kept in balance. There is no such problem where these scrapers are used. The single unit handles the successive operations of digging, hauling and distributing; therefore there is no operation that can get out of balance. All that is required of the management is to see that the unit is in the hands of a good operator, that it keeps moving at the right speed and that it works in the right place.

Efficiency has many ramifications and if the aspect of earth work in which interest usually centers, the construction operations it involves, is to be handled efficiently, a great many problems must be considered and a proper solution of them reached before, and long before, a pound of dirt is moved. Efficiency quite as truly deserves constant consideration as all of the various phases of highway work.

From a paper presented at the Purdue Road School, Lafayette, Ind.

Want information on equipment?
Write the Editor.

Metal-Form Road Rails For Concrete Paving

The specification for road forms or rails which has been agreed upon by a majority of the state highway departments and a Committee of the American Road Builders' Association reads as follows: "The base width on all steel side forms of 8-inch or over shall be 8 inches, and all other side forms, having a height of less than 8 inches, shall have a base width of at least 6 inches." The greater width of base provided for in this agreement adds considerably to the bearing area of the rail, which on many types of soil is a great advantage for the higher rails.

The trapezoidal form of the Metaform rail, made by Metal Forms Corp., Milwaukee, Wis., instead of putting all downward pressure on the vertical web, distributes a considerable portion of it to the bracing web which meets the base approximately 2 inches from the outside edge, and divides the pressure over the entire 8-inch base. On this rail the position of the stake in relation to the base width and the rail height assures rigidity and balance.

Complete descriptions of Metaform road rails will be found in a special bul-

letin which may be secured direct from the manufacturer.



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2-Ton "Lightweight" 75 ft.
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Patent instant gear change and positive internal brake that never fails, and will lock load.
Price, f.o.b.
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5-Ton 4 & 24 to 1 110 lb. \$ 75
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A long reaching boom of alloy metals permits heavier loads at greater radius. The husky, self-aligning center pin eliminates binding and results in smooth swinging and longer life. Equalizing carriages insure against individual wheel overloading. Rigid construction throughout provides for safety and dependability.

Write for Bulletin K-12

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Duluth, Minn.



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THIS Strayer Portable Concrete Plant moved to 115 points over mud, ice and snow to pour over 11,000 yards of concrete to rigid inspection. Many moves made with elevator up and bin partly filled. The crew takes only 30 minutes to set up for operation or to make ready for moving.

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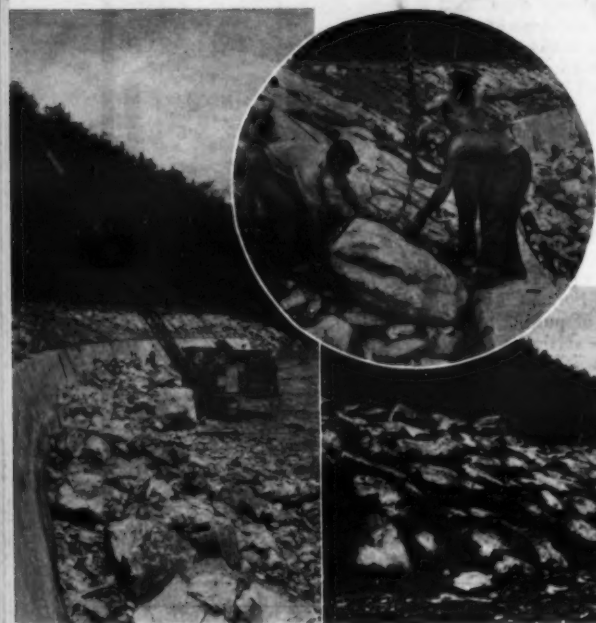
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Placing heavy riprap to protect the Mohawk Trail in western Massachusetts from damage by flood. Left, a Koehring crane setting stone above a concrete retaining wall. Circle, close-up of stone setting. Below, a Koehring paver grouting the riprap. See page 15.

C. & E. M. Photos



A LaPlant-Choute trailbuilder and D4 tractor cleaning up in the Leand Tunnel on the Pennsylvania Turnpike. The steel crew is shown at work on jumbo in the background. See page 2.

Frederickson & Westbrook of Sacramento, California, contractor for a Nevada highway project extending west on U.S. Route 40 for 17 miles from Lovelock, Nevada, is using this Pioneer S-V duplex portable crushing plant, powered by a Caterpillar D1700 diesel engine, for the production of the aggregates.



For many years St. Clair County, Missouri, lacked sufficient funds to maintain its road system adequately, so ruts developed and the ditches filled up. Last year this A-C Model 8 tractor and Model 110 power-controlled grader were purchased in order to make possible regular maintenance of its dirt roads. See page 25.

The repair and reconstruction of the roadways at the New York World's Fair have been rushed to completion for the opening of the Fair on May 11. This Buffalo - Springfield roller was used by the Wm. McDonald Construction Co., contractor for repairs as well as most of the original construction. See page 33.



C. & E. M. Photo
The whole job from center steel to finishing on the 6.51-mile concrete paving project through Eldena, Illinois, for which Edw. M. Roche was the contractor. See page 17.



Turbans and drapes furnish an exotic note to these scenes of bridge and road work in Bombay, India, while a Littleford asphalt kettle and sprayer illustrate the fact that road-building equipment is at home anywhere. See page 20.



Reinforcing steel is ready for forms for a rail post on the new Bridge, Queen Elizabeth. Note the close cracks at the line in the concrete posts. See page 10.

C. & E. M. Photos